

Programme Information		
Programme Title	Programme Code	HECoS Code
MRes AI and Machine Learning	G5ZB	100359

Award	Length of Study	Mode of Study	Entry Point(s)	Total Credits	
				ECTS	CATS
MRes	1 Calendar Year (12 months)	Full-Time	Annually in October	90	180

Ownership			
Awarding Institution	Imperial College London	Faculty	Faculty of Engineering
Teaching Institution	Imperial College London	Department	Computing
Associateship	Diploma of Imperial College (DIC)	Main Location(s) of Study	South Kensington Campus

External Reference	
Relevant <a href="#">QAA Benchmark Statement(s)</a> and/or other external reference points	<a href="#">Computing</a>
<a href="#">FHEQ Level</a>	7
<a href="#">EHEA Level</a>	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 Yingzhen Li
Student cohorts covered by specification	2024-25 entry
Date of introduction of programme	October 21
Date of programme specification/revision	August 24

## Programme Overview

The MRes in AI and ML aims to train a new generation of Artificial Intelligence researchers and innovators and is designed to provide focussed AI training and a high-level, supervised research project that allows students to develop high-level analytical skills, and show their ability to design and lead projects.

AI is becoming increasingly pervasive across many sectors of business and public service, and this growth in application calls for people who combine theoretical grounding in AI with the ability to imagine, lead and deliver Research & Development (R&D) projects that meet exacting regulatory and real-world performance expectations, often working at the interface between AI and other disciplines. The 12-month MRes programme can be a more realistic initial commitment than a PhD for many graduates, people already employed in AI, and many employers - and for some it will also provide a pathway on to a Doctoral programme, able to start their research career with good publications during the MRes studies

The MRes in AI and ML will be a one-year full-time programme leading to the MRes award. The degree is built around one large research project to ensure students demonstrate the ability to manage research independently, learn the multidisciplinary approaches needed to bring AI/ML ideas into practice. Students on the programme would work on a wide range of AI topics, offering the opportunity to work at the leading edge in many areas of AI and across areas as well as numerous leading edge projects applying AI in domains such as health, business and finance, communications, and energy / product supply systems. You would also benefit from the cross-departmental setup, allowing interaction and exchange with students from other areas of AI and computer science in a supportive and inspiring environment; and with students in departments applying AI, to develop their interdisciplinary knowledge.

You would have made your choice of research project prior to beginning the programme. The programme involves taught-module lectures with appropriate assessment (coursework) and practical work in the first term, followed by full-time work on a research project with submission of an individual thesis at the end of the MRes year. The research project would normally be supervised by at least one AI expert, and often by more than one supervisor. Some students may also have a co-supervisor from industry.

You will also be required to complete the programme of professional skills development courses delivered by the Imperial College Graduate School, and would attend seminars and journal clubs throughout the year. A variety of seminars and workshops is provided to deepen and broaden the students' research skill-base.

## Learning Outcomes

Upon completion of the MRes in AI and Machine Learning you will be able to:

1. Apply **broad knowledge of state of the art AI and machine learning**, to critically assess the strengths and weaknesses of a **range of research and innovation approaches**.
2. Apply the principles of the law as well as understanding of **responsible research and innovation**, data protection, ethics and bias relevant to AI research and innovation
3. **Create software for advanced AI** and machine learning using appropriate computing languages (e.g. Python) and frameworks (e.g. PyTorch, Tensorflow).
4. **Evaluate the research literature** and other sources (e.g. patents, software) in depth their chosen field.
5. In their field of in-depth study, identify **key advances, uncertainties and opportunities in AI methods** and the evidence on organisational, business and human factors for applications.
6. Devise an AI **research and development (R&D) proposal for a simulated business case** from scratch, and present the proposal convincingly for decision-makers.
7. **Independently manage a substantial and novel R&D project** and produce a thesis report to include analysis of leading-edge AI methods, evaluation of data sources and devising optimal approaches for AI development and for testing.
8. Conduct an individual research project by managing time and responding to emerging findings and unforeseen challenges to ensure completion within time and resource limits.

9. Present effectively and convincingly scientific data, software, and results; via report writing and face-to-face presentations.
10. Apply skills in **communication, teamwork, leadership and influencing** suitable for work in a fast-moving multidisciplinary environment

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	<p>Successful applicants normally have a 1st UK Honours degree or international equivalent degree, in a relevant scientific or technical discipline, such as computer science, relevant engineering courses, mathematics, statistics and physics - they will all need some programming ability and familiarity with AI basics.</p> <p>Students with other natural science degrees (e.g. life sciences, chemistry, earth sciences) who also have strong mathematical or computing grounding - which must include programming skills and some knowledge of AI basics - may also be considered for relevant projects.</p> <p>For further information on entry requirements, please go to this webpage: <a href="http://www.imperial.ac.uk/study/apply/postgraduate-taught/entry-requirements/accepted-qualifications/">www.imperial.ac.uk/study/apply/postgraduate-taught/entry-requirements/accepted-qualifications/</a></p>
Non-academic Requirements	N/A
English Language Requirement	<p><a href="#">Standard requirement</a> IELTS score of 6.5 overall (minimum 6.0 in all elements)</p>
Admissions Test/Interview	<p>Applicants would typically provide a statement for their chosen project and will complete an admissions test in addition to providing a CV, through the Imperial Applications Portal. Shortlisted applicants will be invited for an interview. Offers are only made to successful applicants based on a project match.</p> <p>Details of the Admissions Tests will be provided in due course. The plan is to have Mathematics, Programming and AI concepts tests which are normally multiple-choice tests, testing expected relevant core knowledge and key concept.</p> <p>You may be invited for an interview. The interviews are conducted by at least one academic member of staff who normally is the MRes project supervisor, and typically last at least 30-40 minutes. Interviews may be held in-person, on the phone or online on Microsoft Teams or Zoom, depending on where participants are based or the current public health situation allowing in-person interviews or not (pandemic).</p>

The programme's competency standards documents can be found at: [www.imperial.ac.uk/computing/prospective-students/courses/competence/](http://www.imperial.ac.uk/computing/prospective-students/courses/competence/)

### Learning & Teaching Approach

#### Learning and Teaching Delivery Methods

- Scheduled Learning & Teaching Methods
- Coursework, often in groups

- Lectures
- Individual research project (one-to-one meetings with supervisors)

- Seminars, symposia & workshops

#### E-learning & Blended Learning Methods

- Virtual Learning Environment: Blackboard
- Online discussions (Piazza)
- Online quizzes and interactive content
- YouTube videos

#### Project Learning Methods:

- Group and individual project work
- Conferences
- Symposia

#### **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 2250 hours per year for the 90 ECTS MRes programme.

For a typical 5 ECTS module, it is expected that around 28 hours would be spent in lectures, tutorials or labs, and ca 97 hours in independent study for the modules. For a typical 10 ECTS module, it is expected to spend ca 50 hours in lectures, seminars or labs and ca 200 hours in independent study. For the project, we expect that students spend 100 hours in research meetings and other research group related activities and 1,400 hours engaged in independent research studies.

#### **Assessment Strategy**

##### Assessment Methods

- Oral presentations including a presentation for non-technical audiences
- Coursework including multiple choice tests, practicals (exercises) and problem sheets
- Written reports, including a research thesis

The various formal assessments of the taught modules (coursework, practicals, and problem sheets) allow the students to apply acquired detailed knowledge and understanding of the essential concepts in the AI and machine learning field, including state-of-the-art coding algorithms, software frameworks, benchmarking datasets, and best practice.

Through the Research Tutorial's assessments, students demonstrate the ability to conduct and assess critically scientific reviews and understand the wider AI domain/landscape. The module leader not only provides feedback on the academic performance, but also on the standard of academic writing and students' presentation skills, which supports the development of professional and personal skills. (reminder: The assessment includes leading a paper discussion, preparing the slides for the presentation, and writing a summary report). The research tutorials will also allow students to develop critical self-evaluation and how to respond to various opinions which are expressed in discussions.

After successfully completing the three assessment formats used for the Individual Research Project, students shall be able to produce a complex research hypothesis, which was informed by their in-depth knowledge of AI algorithms, data set requirements and legal and ethical frameworks. More generally, students will be able to

demonstrate self-direction and originality in tackling and solving problems; they learn how to act autonomously in planning and implementing tasks at a professional or equivalent level.

The module ‘Simulated R&D Proposal’ is assessed by written reports, allowing the student to check on their progress in identifying key advances, uncertainties and opportunities in AI methods and the evidence on organisational, business and human factors for applications. The assessments require the students to develop and write a simulated business case from scratch, with expert decision-makers in mind as a target audience.

	Year of MRes
Coursework	20%
Practical	15%
Exam	5%
Oral	20%
Written	40%

This is followed by a meeting convened by the Programme Director/Deputy, to discuss: progress and any extra support needed; moderation of marks; and suitable scales of ambition and scope for the main projects. All measures are to assure that assessment outcomes are fair and reliable and that assessment criteria have been applied consistently.

#### Academic Feedback Policy

Feedback may be provided in one of a number of formats, including:

- Oral (during or after lectures)
- Personal (discussion with academics and supervisors)
- Interactive (problem solving tutorials with GTAs & study groups)

Individual feedback is normally not provided on written examinations, if such are taken.

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/](http://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/](http://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/](http://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
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 <sup>1</sup>					
Year 1 - FHEQ Level 7					
You will study all core/compulsory modules. Choose exactly ONE module from the elective modules.					
Code	Module Title	Core/ Compulsory/ Elective	Group	Term	Credits
COMP70059	MRes Individual Research Project	Core		Autumn-Summer	60
COMP70060	Simulated Research and Development Project Proposal	Core		Autumn-Summer	10
COMP70061	Research Tutorial	Core		Autumn	10
COMP70076	Ethics, Fairness, and Explanation in AI	Compulsory		Spring	5
COMP70053	Python Programming	Elective		Autumn	5
COMP70006	Computational Finance (not running in 2024-25)	Elective		Autumn	5
COMP70007	Computational Optimisation	Elective		Spring	5
COMP70010	Deep Learning	Elective		Spring	5
COMP70014	Machine Learning for Imaging	Elective		Spring	5
COMP70015	Mathematics for Machine Learning	Elective		Autumn	5
COMP70016	Natural Language Processing	Elective		Spring	5
COMP70021	Quantum Computing	Elective		Autumn	5
COMP70028	Reinforcement Learning	Elective		Autumn	5
COMP70031	Modal Logic for Strategic Reasoning	Elective		Spring	5
COMP70050	Introduction to Machine Learning	Elective		Autumn	5
COMP70110	Computer Vision	Elective		Autumn	5
COMP70067	Robot Learning	Elective		Spring	5
COMP70077	Introduction to Symbolic Artificial Intelligence	Elective		Autumn	5
COMP70084	Robotics	Elective		Spring	5

<sup>1</sup> **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.

COMP70100	Computational Neurodynamics	Elective		Autumn	5
COMP70101	Human-Robot Interaction (not running in 2024-25)	Elective		Autumn	5
COMP70103	Statistical Information Theory	Elective		Autumn	5
COMP70105	Deep Graph-Based Learning	Elective		Spring	5
				Credit Total	90

**Award and Classification for Postgraduate Students**

**Award of a Postgraduate Degree (MRes)**

To qualify for the award of a postgraduate you must have:

1. accumulated credit to the value of no fewer than 90 credits at level 7 or above of which no more than 15 credits may be from credit level 6;
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/apply/postgraduate-taught/entry-requirements/accepted-qualifications/](http://www.imperial.ac.uk/study/apply/postgraduate-taught/entry-requirements/accepted-qualifications/)

Imperial's Quality & Enhancement Framework is available at:  
[www.imperial.ac.uk/registry/proceduresandregulations/qualityassurance](http://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](http://www.imperial.ac.uk/about/governance/academic-governance/regulations)

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[www.imperial.ac.uk/admin-services/secretariat/college-governance/charters/](http://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/](http://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.