Programme Information		
Programme Title	Programme Code	HECoS Code
Design Engineering Research	H901	For Registry Use Only

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
PG Diploma* - H901D	N/A	N/A	N/A	60	120
PG Certificate* - H901C	N/A	N/A	N/A	30	60
*The PG Certificate and PG Diploma are exit awards and 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	Dyson School of Design 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 Award in Engineering Master's Awards in Mathematics, Statistics and Operational Research	
FHEQ 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 Billy Wu
Student cohorts covered by specification	2024-25 entry
Date of introduction of programme	October 24
Date of programme specification/revision	May 23

Programme Overview

The vision of the MRes Design Engineering Research is to produce world-class students in transdisciplinary design engineering research.

Design Engineering operates at the intersection of design practice, engineering applications, scientific grounding and contextual application, with transdisciplinary research producing knowledge that goes beyond existing disciplines; integrating a diverse set of academic and non-academic stakeholders. Challenges that Design Engineers explore span performance, systemic, contextual and global challenges.

To equip you with the key skills towards becoming world-leading design engineering researchers, the MRes in Design Engineering Research thus proposes an exciting collection of taught modules leading towards the execution of a major research project. In the autumn term, the Design Engineering Practice module will equip you with key design engineering tools and practices that allow you to systematically handle and embrace uncertainty. The Modelling and Simulation module will teach you how to describe complex systems mathematically, towards simulating their behaviours and then apply probabilistic principles from Game Theory towards understanding the impact of decisions and how uncertainty propagates through the system.

Foundational Transdisciplinary Research Methods (undertaken in the autumn term) and Advanced Transdisciplinary Research Methods (undertaken in the spring term) then formally introduce you to what transdisciplinary research is, as well as a mixture of qualitative and quantitative research tools that allow you to engage a diverse set of stakeholders towards generating rich insights. Here tools start from qualitative topics such as interviews, narrative studies and ethnographic approaches, as well as quantitative tools such as frequentist descriptive/inferential statistics, experiment design and survey design. This then builds to more advanced tools such as Bayesian inference, statistical modelling (e.g. Markov chain Monte Carlo methods) and reflexivity, leading to the exploration of emerging tools such as text mining, sentiment analysis and natural language processing. In doing this, you will gain a critical understanding of the role of the researcher and the various types of tools in research.

You will have the option of deepening your subject-specific knowledge with the selection of two elective modules (one in each term) which span a diverse set of topic areas, including Machine Learning for Design Engineers, Design for Additive Manufacturing, Design Psychology, Design Analytics for the Sharing Economy, Designing Interventions for Behaviour Change and others.

These taught elements then culminate in the execution of a novel piece of Design Engineering research with the Research Master's Project, which spans the entire programme, allowing sufficient time to critically understand the state-of-the-art in that field, plan and execution of a programme of research and ultimately create new insights. Projects can be generated by the supervisor or by you (with the support of an academic supervisor and approved by the module lead), with these advertised before the start of the academic year and allocations made at the beginning of Autumn term. Here you will rank your project preferences from the list of supervisor generated projects and write a short statement of motivation (unless you already have an agreed self-generated project with academic supervisor and module lead support). Project allocation will then be done by the module lead, based on maximising top preferences, information provided in supporting statements and academic loading. During the execution of the Research Master's Project, there will be opportunities to present your work to leading industry stakeholders from our industrial advisory board, as well as large public outreach events (The Great Exhibition Road Festival). 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. On completion at the end of August/September, it is anticipated that you will be well placed for onward study on a PhD programme or in industry research roles; spanning industries such as technology, energy, healthcare and finance.

Some modules (Design Engineering Practices, Foundational Transdisciplinary Research Methods and Advanced Transdisciplinary Research Methods) and electives will be shared with the MSc Programmes in Design Engineering

and Design with Behaviour Science, alongside the electives with the MEng in Design Engineering; enabling cross-pollination of experiences. An overview of the programme structure is shown in Figure 1.

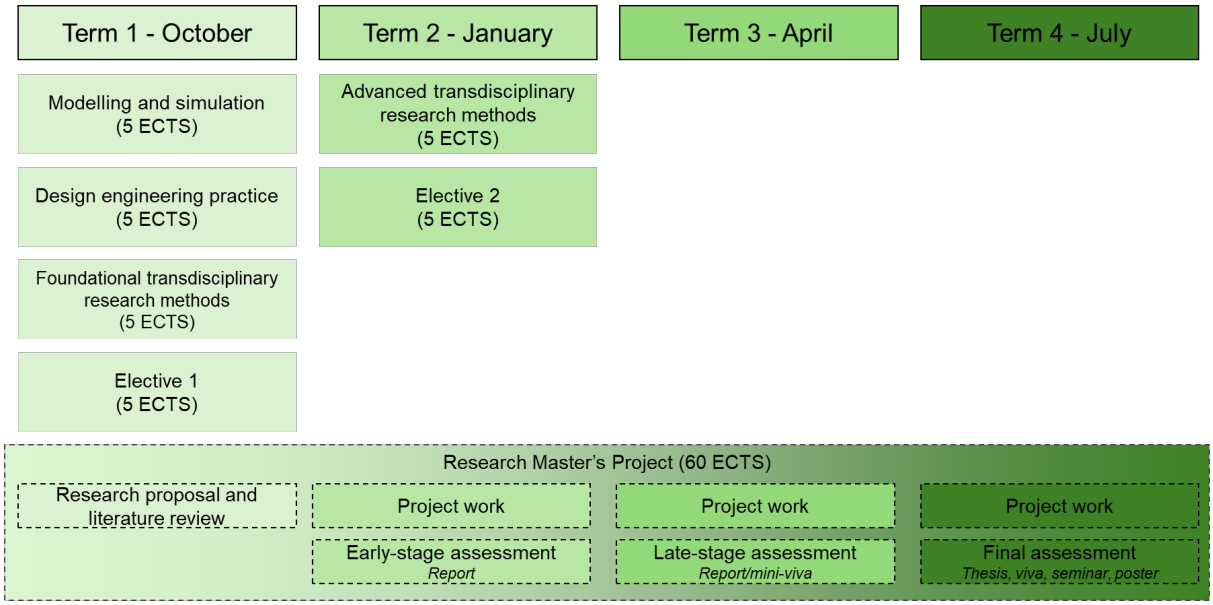

Figure 1 - MRes Design Engineering Research degree structure

Learning Outcomes

Upon successful completion of the programme, you will be able to:

1. *Design Engineering Methods:* Select appropriate design engineering processes, methods, techniques, tools, and user research and apply them with high levels of skill and creativity.
2. *Contextual Evaluation & Impact Analysis:* Develop strategies to evaluate contexts and systems that are complex or ambiguous calculate, measure, and monitor the impact of design work across scales.
3. *Design Engineering Mindset:* Synthesise new knowledge, understanding, and skills in effective ways to develop strategies for working with uncertainty and ambiguity.
4. *Communications:* Communicate effectively using a range of media directed to a variety of relevant stakeholders.
5. *Team Working:* Demonstrate individual responsibilities of managing and contributing to effective and diverse teams.
6. *Professional Identity:* Reflect on personal development to define an evolving individual skill set, professional identity, and context of operation.
7. *Modelling and simulation:* Analyse complex systems and create mathematical descriptions of these with modelling and simulation approaches.
8. *Uncertainty in complex systems*: Evaluate simulation results with a probabilistic lens towards proposing optimal system solutions.
9. *Research skills*: Evaluate the state-of-the-art in design engineering research towards creating and executing a research plan which solves a complex design engineering problem.
10. *Scientific rigour*: Generate new research insights through the execution of a design engineering research project, with research hypothesis rigorously validated

Students exiting with a PG Certificate in Design Engineering Research will have accomplished at least learning objectives 1, 3 and 4.

Students exiting with a PG Diploma in Design Engineering Research will have accomplished at least learning outcomes 1, 2, 3, 4 and 5.

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 equivalent to a First-class UK Bachelor's Degree with Honours in a Science, Technology and Engineering discipline (or a comparable qualification recognised by the university). In some circumstances, we may also accept those with a 2:1 equivalent if you have substantial (more than 2 years) professional experience or further studies in a related area. For further information on entry requirements, please go to: www.imperial.ac.uk/study/pg/apply/requirements/pgacademic
Non-academic Requirements	• A 2-page CV highlighting relevant skills and experiences for the degree. • Two academic/professional references evidencing your research skills. • A written statement articulating motivation and suitability for the degree.
English Language Requirement	Higher requirement (PG) Please check for other Accepted English Qualifications
Admissions Test/Interview	Candidates who are shortlisted will be invited to attend an interview with an Academic member of staff covering engineering, design and research. This will normally be conducted remotely online.
The programme's competency standards documents are available from the department.	

Learning & Teaching Approach

Learning and Teaching Delivery Methods

The Dyson School of Design Engineering and the MRes in Design Engineering Research places a strong emphasis on professionally relevant and scientifically rigorous project-based learning. Students attend lectures and access online learning resources to support knowledge acquisition. Here, a key element of researcher development, is also the ability to critique the academic literature, identify research gaps and create a plan for testing research hypothesis. Knowledge, intellectual and practical skills relating to our diverse curriculum are developed within a planned sequence of modules and are developed through a variety of learning formats, consummate of design engineering research careers. Primarily through project-based learning, but supported with intensive skills development sessions in workshops, journal clubs, studios and labs, group and individual tutorials, group working, and a variety of presentation and peer review formats.

Typical class sizes will range from 10-90 students and will involve the following:

- *Authentic project-based learning (APBL):* You will work on engaging real-world projects based on core, industrially relevant research challenges, potentially collaborating with industrial partners, and using a range of Design Engineering methodologies.
- *Team-Based Working:* You will work in teams to support your knowledge acquisition in dynamic and challenging projects with multiple types of interactions, which will include Peer Review.
- *Technology Enhanced Learning:* All core module and programme materials are available via Blackboard. You will have direct access to an extensive range of specialist software (Matlab, Solidworks, Adobe CC etc) and online learning opportunities through the university.
- *Presentations:* Multiple formats integrating verbal, visual, video and physical artefact content to build your communication skills to a wide audience, and support assessment.
- *Workshops and labs:* You will have facilitated access to relevant workshops and labs, as well as tutor/supervisor and self-directed work in support of APBL across a wide range of facilities upon passing all the required safety training and inductions.

- *Lectures:* Talks to deliver key content for modules, including input from a range of external speakers and experts from the university, providing overviews of key concepts and facilitating learning. Typically lectures are given to the whole cohort.
- *Guest lectures*: Curated talks by external experts from diverse real-world organisations, monitored for relevance and depth by module leaders.
- *Tutorials:* Group and individual formats to support APBL, understanding and skills development. Tutorials can take place both individually (such as with a personal tutor or project supervisor), or in groups (such as during project work, workshops or peer development).
- *Immersive experiences*: Visits or immersive experiences (e.g. Sprints / Hackathons) at real-world organisation.
- *Independent Study:* All modules involve an aspect of individual and team-based study time to develop work and ideas.

Overall Workload

Your overall workload consists of face-to-face sessions and independent learning. While your actual contact hours may vary according to the elective 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.

Term 1 starts with Five 5 ECTS modules (Design Engineering Practice, Modelling and Simulation, Foundational Transdisciplinary Research Methods, Research Master's Project (5 ECTS) and Elective 1). These 5 ECTS modules represent approximately 125 hours' worth of study hours each, with approximately 26% of this time being taught and 74% being self-study. The taught elements include lectures, tutorials and lab work, with self-study time for consolidating learning and executing project work.

In Term 2, there are two 5 ECTS modules (Advanced Transdisciplinary Research Methods and Elective 2) which follow the same split in taught vs self-study in Term 1 modules. Students also continue their Research project which spans Term 1-4, with 15 ECTS worth of effort in Term 2. The Research Master's Project as a whole (60 ECTS) will consist of approximately 1,500 hours' worth of study time, with this being split ~15% taught and ~85% self-study time within the project. The taught elements include lectures on scientific writing, journal clubs and supervision meetings. The self-study element allows students to focus on the execution of their research project. Over the terms that the Research Project is active, it is anticipated that students will spend 5 ECTS (125 hours) in Term 1, 15 ECTS (375 hours) in Term 2, and 20 ECTSs (500 hours) in Term 3 and 4 (each) on the project. Terms 3 and 4 are exclusively for the project work, with Term 2 ramping up the amount of project work.

The total contact hours, class sizes, methods of assessment, and types of learning will vary depending on the elective subjects taken.

Assessment Strategy

Assessment Methods

The programme uses a wide range of assessment methods with an emphasis on professionally relevant practice, scientific rigour and the project-based mode of study/research, with these equipping students with skills and experiences needed for onward research careers.. Assessment methods are carefully mapped to the intended learning outcomes of any given module with the goal of always using the most efficient and authentic approach to assessing how learning outcomes are met. Here, for the MRes, a strong focus is placed on demonstrating your ability to critique the state-of-the-art literature in a research problem, identify research gaps and plan/execute a plan to test a research hypothesis.

Coursework components are defined as those having (physical or digital) submissions allowed until a deadline. Practical components take place during a timetabled session with a submission and/or assessment during the session, such as presentations or lab exercises. Examinations take place under exam conditions with an invigilator present. More information on assessment types can be found on the Imperial website. For the MRes, there is a strong focus on demonstrating research skills via primary research using engineering skills with diverse approaches including detailed lab work, simulation-based study or equivalent.

Assessment methods adopted by the programme are summarised as follows:

- *Project Presentations:* Oral and visual presentations (e.g., with slides and videos) as a means of demonstrating meeting a wide range of outcomes.
- *Project Artefact:* For example, physical and digital prototype deliverables from projects are used to directly evaluate physical and intellectual skill-based outcomes.
- *Demonstrations & Exhibitions*: To validate and showcase project outputs to wider audiences to demonstrate synthesis of a wide range of intended outcomes.
- *Peer assessment of group working:* Used wherever there is a substantial team or group aspect of work to evaluate how well team working outcomes are met.
- *Visual reports, technical reports and essays:* Various formats for reporting based on authenticity in relation to the assignment and to synthesis assessment of a wide range of learning outcomes.
- *Lab books, online project records, lo-fi prototyping and sketchbooks:* Used as evidence for assessment within APBL to evaluate meeting learning outcomes related to understanding & management.
- *Online progress tests:* Used selectively as a basis for formative and summative evaluation and feedback on learning progress in relation to knowledge and understanding outcomes.
- *Written examinations:* Used selectively to demonstrate achieving learning outcomes in relation to knowledge and understanding.
- *Verbal examinations (vivas)*: Used to demonstrate the ability to communicate understanding and interpretation of scientific work.

In addition to summative assessment points (assessment with grades counting towards a final degree classification), you will have opportunities to receive initial, indicative (i.e., formative) assessment and feedback on your work. This type of feedback is designed to help you improve and does not count towards your grades or progression. During formative feedback points, we expect you to keep notes of comments and verbal feedback, providing aid to reflective learning. Informal feedback may also occur in peer reviews and on an ad-hoc basis with a range of visiting tutors from the wider university or industry. Most of the project-based formative and summative assessment formats are a basis for you to progressively develop important understanding, skills and attitudes as an integral part of your learning.

Academic Feedback Policy

The School adheres to the policies and principles for academic feedback provided by the university.

Academic feedback to students
At module level, overall assessment arrangements are published to students from the start of the module. This information includes a detailed breakdown of assessment criteria, mapping to module learning outcomes and indicative criteria grade descriptors.

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

- *Verbal:* For example, during a lecture or as part of a group discussion or a presentation a staff member may give verbal feedback and advice.
- *Written:* For example, a staff member may send feedback in writing after the submission of a piece of coursework or practical demonstration.
- *Personal:* For example, through one-to-one discussions with personal tutors or project supervisors.
- *Interactive:* For example, within tutorials, workshops and study groups working alongside peers and staff members.

Summative assessments include a proportion of independent marking as a means of safeguarding and assuring academic standards, as determined by university policy. Provisional assessment results and feedback are returned to students within 10 working days unless students are notified in advance of an extended assessment period.

Student feedback to staff
Students have a variety of feedback mechanisms to discuss the quality of the learning and teaching experience, through termly surveys, open programme forums and their programme representatives. This informs quality enhancement within the School.

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
Equipment, Materials and Books (modules with a practical component will usually involve a workshop budget to support physical building costs)	Optional	£200-£1,000
Laptops and Software (a number of laptops are provided by the School with all relevant software)	Optional	£500-£1,500

Programme Structure[1]

Core/Compulsory Modules - FHEQ Level 7
You will study all core and compulsory modules below and then select 1 elective in the autumn term and 1 in the spring term.

Code	Module Title	Core/ Compulsory/ Elective	Group	Term	Credits
DESE71009	Design Engineering Practice	Compulsory		Autumn	5
DESE71010	Foundational Transdisciplinary Research Methods	Compulsory		Autumn	5
DESE71019	Modelling and Simulation	Core		Autumn	5
DESE71012	Advanced Transdisciplinary Research Methods	Compulsory		Spring	5
DESE71021	Research Master's Project	Core		Autumn-Summer	60
				Credit Total	80

Electives – FHEQ Level 6
You are permitted to choose one elective as offered below at Level 6 (up to a maximum of 5 credits total) during the Spring term.

Code	Module Title	Core/ Compulsory/ Elective	Group	Term	Credits
DESE61001	Advanced Industrial Design	Elective		Spring	5
DESE61003	Audio Experience Design	Elective		Spring	5
DESE60006	Designing Interventions for Behaviour Change	Elective		Spring	5
DESE60011	Economics and Finance for Systems Design	Elective		Spring	5
DESE61008	Games and Mechanisms	Elective		Spring	5
DESE60010	Machine Learning for Design Engineers	Elective		Spring	5
DESE60020	Sustainable Energy Storage Design	Elective		Spring	5
DESE60022	User Interfaces and Interactions	Elective		Spring	5
				Credit total	0–5

Electives – FHEQ Level 7
You must choose a minimum of one and up to two electives from those offered below at Level 7.

Code	Module Title	Core/ Compulsory/ Elective	Group	Term	Credits

[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.

DESE71016	Design Psychology	Elective		Autumn	5
DESE70006	Design Analytics for the Sharing Economy	Elective		Autumn	5
DESE71007	Distributed Ledger Technologies (not running in 2024-25)	Elective		Autumn	5
DESE71006	From Data to Product	Elective		Autumn	5
DESE70005	Nano Design Engineering	Elective		Autumn	5
DESE70007	Responsible Engineering and Design Innovation	Elective		Autumn	5
DESE71002	Robotics Research Projects	Elective		Autumn	5
DESE71003	Sensing and Internet of Things	Elective		Autumn	5
DESE71005	Transformational Play	Elective		Spring	5
DESE71020	Design for Additive Manufacturing	Elective		Spring	5
DESE71004	Design of Visual Systems	Elective		Spring	5
DESE71017	Inferential Statistics and Causal Reasoning	Elective		Spring	5
DESE71018	Sustainable Design and Strategy	Elective		Spring	5
				Credit total	5–10

Progression and Classification

Award and Classification for Postgraduate Students

Award of a Postgraduate Certificate (PG Cert)
To qualify for the award of a postgraduate certificate you must have:

1. Accumulated a minimum of 30 credits (of which no more than 5 credits may be at Level 6).

Award of a Postgraduate Diploma (PG Dip)
To qualify for the award of a postgraduate diploma you must have:

1. accumulated a minimum of 60 credits (of which no more than 5 credits may be at Level 6).
2. and no more than 10 credits as a Compensated Pass.

Award of a Masters Degree (MSc)
To qualify for the award of a masters degree you must have:

1. accumulated a minimum of 90 credits (of which no more than 5 credits may be at Level 6);
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%.

For a Master's degree, your classification will be determined through the Programme Overall Weighted Average meeting the threshold for the relevant classification band.

Modules taken at level 6 will contribute to the determination of pass, merit or distinction, and are included in the calculation of the overall weighted average.

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: https://www.imperial.ac.uk/about/governance/academic-governance/
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 a 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.