

Programme Information		
Programme Title	Programme Code	HECoS Code
Cleantech Innovation	H4C1	For Registry Use Only

Award	Length of Study	Mode of Study	Entry Point(s)	Total Credits	
				ECTS	CATS
MSc	1 Calendar Year (12 months)	Full-Time	Annually in October	90	180
PG Diploma (H4CD1)	N/A	N/A	N/A	60	120
PG Certificate (H4CC1)	N/A	N/A	N/A	30	60

*The PG Certificate and Diploma are exit awards and not available for entry. You must apply to and join the MSc.

Ownership			
Awarding Institution	Imperial College London	Faculty	Faculty of Engineering
Teaching Institution	Imperial College London	Department	Dyson School of Design Engineering Grantham Institute – Climate Change and the Environment
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 Degree in Business and Management Master's Degree in Engineering
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 Elena Dieckmann, Dyson School of Design Engineering Alyssa Gilbert (Co-Lead), Grantham Institute – Climate Change and the Environment		
Student cohorts covered by specification	2024-25 entry		
Date of introduction of programme	October 2024		
Date of programme specification/revision	September 2023		

Programme Overview
<p>The MSc in Cleantech Innovation, led by the Dyson School of Design Engineering and the Grantham Institute – Climate Change and the Environment, is designed to educate and train you to develop technological solutions to problems of unsustainability within specific contemporary climate challenge themes, which may include topics such as Agriculture & Food, Clean Energy & Storage, Transportation, Air & Environment, Circular Economy & Industry, Water, Efficiency. The programme is designed to equip you with the knowledge and skills to develop and implement innovation in at least one of the above mentioned cleantech areas.</p> <p>The Grantham Institute is Imperial College London's hub for climate change and the environment, and one of Imperial's seven Global Institutes established to promote interdisciplinary working and to meet some of the greatest challenges faced by society. The Grantham Institute also leads Undaunted, one of Europe's foremost climate impact accelerator programmes, based at the Royal Institution. We drive forward discovery, convert innovations into applications, train future leaders and communicate academic knowledge to businesses, industry, and policymakers to help shape their decisions. The Dyson School of Design Engineering is the tenth and newest engineering department at Imperial College London. Our goal is to fuse design thinking, engineering knowledge, and practice to foster a culture of innovation and enterprise and help solve global problems with an emphasis on sustainability, entrepreneurship, and societal impact.</p> <p>Solutions are becoming ever-more pressing as we come close to breaching several “planetary boundaries”, moving the planet into a precarious state that may not be able to support society as it is today. The MSc in Cleantech Innovation aims to provide you with the skills of a cleantech entrepreneur, addressing the most pressing environmental and climate challenges our planet is facing through leveraging cleantech research for innovation across Imperial College London.</p> <p>The MSc in Cleantech Innovation is offered over 12 months full-time. The programme content reflects the contemporary and relevant entrepreneurship skills necessary for developing cleantech innovation and launching a start-up. There is a balance of theory and individual and group work to realize impactful cleantech innovation across seven impact areas [Clean Energy, Clean Industry, Clean Food, Clean Environment, Clean Water, Clean Materials, and Clean Transportation] taught by cleantech experts at Imperial. Case study methodology and class-based discussions are used to strengthen your conceptual, analytical, and problem-solving skills in real situations. In addition, there are regular seminars by external expert speakers from cleantech ventures.</p> <p>The taught component of the programme is delivered over three academic terms. Over the summer period, you will complete a thesis on your Team Project and submit a self-reflection portfolio as part of a Greenhouse Residency Project (accelerator programme at Undaunted). 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.</p>

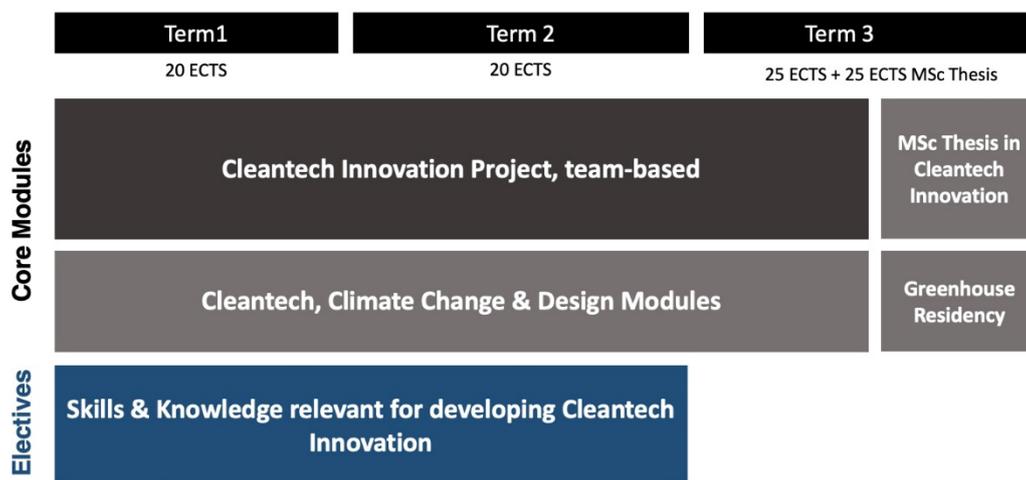


Figure 1: Programme Overview MSc Cleantech Innovation

Over the first two terms, you will gain an understanding of the climate change challenges, environmental problems affecting different contexts, and foundational clean technology in the seven impact areas. You will learn progressively about the different stages of the entrepreneurship journey, including ideation & prototyping; business model; customer discovery; and pitching. Simultaneously, you will learn skills in design engineering, which will enable you to conclude your innovation project as part of the annual design showcase of the Dyson School of Design Engineering. This is held on the South Kensington campus and incorporates work by all programmes from the School, including MEng and the other MSc programmes. In the last term, culminating at the end of August, you will submit an MSc Thesis and collaborate on a project with an existing cleantech start-up of the greenhouse accelerator.

The MSc curriculum will be project-focused, where learning and teaching are done by way of practical innovation and entrepreneurship challenges set to small groups of students, who work individually and in teams in a self-directed, but supported, manner. The MSc in Cleantech Innovation offers intensive teamwork experience, like a typical early-stage start-up. You will be assigned to your team at the start of the programme and work with that team on the Cleantech Innovation Project over terms 1 to 3. Your core and compulsory modules, which are related to the Cleantech Innovation Project, plus the elective modules will run in parallel to your Cleantech Innovation Project. As the programme emphasises self-directed learning, there will be little “traditional” lecturing, rather the concepts and problems are presented in a way as to facilitate your self-directed learning. The programme directors and teaching fellows will be your coaches, and they will facilitate learning across technical aspects, both in team and individual efficacy dimensions, and will be present to support and guide you throughout the year, via tutorials, group sessions, and informal discussions.

You will be based at the Dyson School of Design Engineering (DSDE) on the South Kensington campus, where the Grantham Institute – Climate Change and the Environment is also located. You will have access to facilities at the Dyson School of Design Engineering Workshops (ACE) to support your innovation. You will also spend some time at Undaunted (formerly the Centre for Climate Change and Innovation) at the Royal Institution, a short bus ride or walk away, allowing you to interact with climate change start-ups.

Upon completion, you will be equipped with the skills to seek employment in a range of roles in the cleantech sector and environmental engineering industry, or continue your start-ups, join other cleantech start-ups, or take on consultancy roles. Roles in product management of cleantech and environmental engineering companies and within companies focusing on sustainable engineering and sustainable product design will be relevant.

Learning Outcomes

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

1	Contextual evaluation & impact analysis	Collate, critically analyse and interpret relevant information that helps identify environmental and climate change challenges in a national and international context that can be tackled using engineering knowledge, skills and tools.
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2	Cleantech Innovator's mindset	Synthesize expertise in cleantech research and design engineering through an innovation project and validate the technology by engaging with different stakeholders and academic experts.
3	Team working	Develop your ability to work in transdisciplinary teams to leverage different problem-solving approaches for difficult environmental challenges.
4	Professional identity	Reflect and evolve on professional identity in the context of being a cleantech innovator.
5	Prototyping	Build early prototypes through design engineering tools, iterate and optimise the technology through engaging the research community, and develop methods to allow transfer a cleantech technology from lab to applied context.
6	Cleantech Entrepreneur	Critically analyse the current state of the cleantech industry and its potential impact on society and the environment to explore the role of innovation and entrepreneurship in developing climate-resilient solutions.
7	Business Model Innovation	Develop novel approaches how cleantech innovations can be introduced into organizations through the development, communication and deployment of business models, business plans, networking and negotiating skills.
8	Impact	Design strategies to calculate, measure, and monitor environmental and societal impact of cleantech innovation
9	Systems thinking	Apply systems thinking to extract the interrelatedness of social, economic, and environmental aspects of climate change.

Students exiting with a PG Certificate in Cleantech Innovation will have accomplished at least learning outcomes 1, 3, 7, 8.

Students exiting with a PG Diploma in Cleantech Innovation will have accomplished at least learning outcomes 1, 2, 3, 4, 7, 8, 9.

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>The minimum entry requirement is a 2.1 UK Honours degree (or equivalent) in a Science, Technology or Engineering discipline (or a comparable qualification recognised by the university). Applications from the areas of Design Engineering, Architecture and Industrial Design are encouraged.</p> <p>For further information on entry requirements, please go to: www.imperial.ac.uk/study/apply/postgraduate-taught/entry-requirements/accepted-qualifications/</p>
Non-academic Requirements	<p>Candidates, who don't hold a degree in a Science, Technology or Engineering discipline, but hold a 2.1 UK Honours degree in other disciplines and fulfil one or more of the following:</p> <ul style="list-style-type: none"> - a genuine passion for sustainability and engineering that extends beyond academic study and is evidenced through a variety of extracurricular, impactful projects - demonstrated exceptional leadership abilities in a start-up or corporate environment - have an evidenced track record of producing innovation - display excellency through esteemed awards in any of the following areas: design engineering, engineering, chemistry, chemical

	<p>engineering, environmental studies, design, sustainability and science, climate science</p> <p>are invited to apply and may be considered for an interview.</p> <p>The additional entry requirement criteria will be evaluated through evidence, such as a portfolio of (successful) projects, and professional review/recommendation letters from specific references, e.g. reputable employers, RAE, NGOs, national or international competitions, or other recognised institutions, Patents.</p>
English Language Requirement	<p>Higher level English requirement (PG) Please check for other Accepted English Qualifications</p>
Admissions Test/Interview	<p>Candidates who are shortlisted will be invited to attend an online interview with an Academic member of staff.</p>

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

Learning & Teaching Approach

Learning and Teaching Delivery Methods

With an emphasis on professionally relevant, project-based learning, you will be supported with a number of learning and teaching methods, which will include:

- problem-focused tutor-facilitated active discussions
- self-directed learning, facilitated as appropriate
- team-based learning, facilitated as appropriate
- case study methodology
- personal development plans (PDP) developed with support from your personal tutor
- peer observation and assessment
- presenting outputs in a variety of formats, including verbal, visual and video content to build your communication skills to a wide audience
- tutorials, both group and individual, to support authentic project-based learning (APBL), understanding and skills development. Tutorials can take place both individually or in small groups (such as during project work, workshops or peer assessment)
- workshops and labs: you have facilitated access to relevant workshops, as well as tutor and self-directed work in support of APBL across a wide range of facilities upon passing all the required safety training and inductions
- technology-enhanced learning, all core and programme materials will be available via our virtual learning environment, Blackboard. You will have access to a range of specialist software and online learning opportunities through the university
- lectures on specialist topics will deliver key content for modules, including input from some external speakers and experts in cleantech from the university.

Throughout the programme, you will work in a team to design and implement an extended project within the Cleantech Innovation Project Modules. While writing your thesis on the innovation project, you will undertake an eight-week residency project with a start-up of the [Greenhouse Accelerator](#). A list of available projects will be published to students at the start of the summer term and candidate matching will be conducted in partnership with the start-ups of the greenhouse accelerator through a speed-dating event.

In addition, there will be seminars and events held with our Climate Change and Innovation community, the Dyson School for Design Engineering community and the Grantham Institute - Climate Change and the Environment networks. There will be other cohort activities designed for you including inter-cohort activities with related masters across Imperial. Experts from different cleantech research groups will be engaged to deliver timely input through tutorials, lab visits and technical consultations. Depending on topics, we expect experts to be sourced from the vast network of affiliates of the Grantham Institute, the Dyson School of Design Engineering, Civil & Environmental

Engineering, Chemical Engineering, Materials, Earth Science and Engineering & Enterprise Lab among others. A townhall style networking event will be held at the beginning of October to offer a possibility for potential collaborators to meet.

Overall Workload

While your actual contact hours may vary according to your teamwork and your role in that team, the following gives an indication of how much time you will need to allocate to different activities at each level of the programme:

- 18% of your time in lectures, seminars and tutorials
- 70% independent study
- 12% in specialist events, such as networking, pitches and excursions

At Imperial, each ECTS credit taken equates to an expected total study time of 25 hours. Therefore, the expected total of contact hours and study time is 2,250 hours.

Assessment Strategy

Assessment Methods

The Assessment Strategy for this programme focuses on formative assessments for the initial part of the modules, with summative assessments on outputs toward the end of each module. This is to allow you to develop within your teams as well as to progress your personal development throughout each module ahead of the summative assessments.

The core modules assessments are mostly project-based and can include prototypes, demonstrations, exhibitions, and presentations whilst some of the compulsory and elective modules are exam based.

Assessment methods adopted by the programme are summarised below:

Method	Note on achieving Intended Learning Outcomes
Project presentations	Oral and visual presentations (e.g. with slides and videos) as a means of demonstrating meeting a wide range of outcomes.
Project artefacts	For example, physical and digital prototypes from projects are used to directly evaluate the 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.
Visual reports, technical reports, and essays	Varied formats of reporting on authenticity, novelty, and review of the wide range of learning outcomes.
Lo-fi prototyping and sketchbooks	Used as evidence for assessment to evaluate meeting learning outcomes related to understanding & management.
Written examinations	Used selectively to demonstrate achieving learning outcomes in relation to knowledge and understanding (elective modules only).
Report	Used to reflect and conclude project work and contextualise learning and impact.

For each module in the first two terms, you will:

- Have formative discussions in your teams with tutors, whilst you critically analyse the problem and decide on a set of plausible solutions and projected sustainability impacts and prepare a project management strategy and plan (ILOs 1, 2, 3, 4, 7, 8, 9).
- Prepare a set of group outputs for summative assessment, whose detailed content depends on the module's objectives, but will usually consist of:
 - A defined output report of that module, consisting of a written summary and accompanying prototype artefact(s).
 - A presentation of the outputs to your peers and tutors.

- A background report recording the processes undertaken that led to the primary document, a bibliography of sources used, and a record of the contributions made by team members and salient lessons learned. (ILOs 1-9)

You will complete a residency with a climate change start-up in the third term. You will submit a report reflecting on the experience of the residency with an analysis of the contribution to the development of the company. This will be marked summatively. (ILO 4)

The second term team project will also be assessed summatively. You will deliver a complete start-up investment proposal, supported by a pitch to a panel of investors and an audience of your peers. Additionally, you will submit a report on the process you undertook to develop the idea, business model, and pitch, along with the details of each team member's contributions. (ILOs 1-9)

Formative assessments will include feedback from tutors, academics, and peers and actively inform personal and team development plans.

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 from the start of the module in the programme handbook. This information includes a detailed breakdown of the 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 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 assigned at the start of the programme 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

A variety of feedback mechanisms are available to discuss the quality of the learning and teaching experience, through termly surveys, open programme forums and your student 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
Laptop	Mandatory	£600

Programme Structure¹**Year 1 - FHEQ Level 7**

You will study all compulsory and core modules and choose one module from Elective Group A and one module from Elective Group B.

Code	Module Title	Core/ Compulsory/ Elective	Group	Term	Credits
DESE70039	Cleantech Innovation Project Part 1: Ideation, Design Methods & Prototyping	Core		Autumn	5
DESE71006	From Data to Product	Elective	A	Autumn	5
DESE70007	Responsible Engineering and Design Innovation	Elective	A	Autumn	5
DESE70005	Nano Design Engineering	Elective	A	Autumn	5
DESE70042	Climate Change for Cleantech Innovators	Core		Autumn	10
DESE70040	Cleantech Innovation Project Part 2: Business Model & Customer Discovery & Pitch	Core		Spring	10
DESE70043	Design Engineering Tools for Cleantech Entrepreneurs	Compulsory		Spring	5
CIVE70053	Sustainable Resource Management	Elective	B	Spring	5
DESE71004	Design of Visual Systems	Elective	B	Spring	5
DESE71020	Design for Additive Manufacturing	Elective	B	Spring	5
DESE60020	Sustainable Energy Storage Design	Elective	B	Spring	5
DESE70045	Life Cycle Assessment (LCA) & Social Impact for Cleantech Innovations	Compulsory		Summer	5
DESE70041	Cleantech Innovation Project Part 3: Advanced Prototyping & Asset Creation	Core		Summer	10
DESE70044	Greenhouse Residency Project	Compulsory		Summer	10
DESE70046	MSc Thesis in Cleantech Innovation	Core		Summer	25
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.

Award and Classification for Postgraduate Students

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 at Level 7;
2. and no more than 15 credits as a Compensated Pass.

Exit Awards

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 at Level 7.

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 at Level 7.
2. and no more than 10 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 Masters, 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 will be available from the department.

The Module Handbooks will be 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.