Programme Information		
Programme Title	Programme Code	HECoS Code
Environmental Engineering with Data Science	H2UMD	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	N/A	N/A	N/A	60	120
PG Certificate	N/A	N/A	N/A	30	60
The PG Certificate and PG Diploma are exit awards and are 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	Civil and Environmental 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 Degrees in Science	
FHEQ Level		Level 7	
EHEA Level		2nd Cycle	
External Accreditor(s) (if applicable)			
External Accreditor 1:	Joint Board of Moderators (JBM)		
Accreditation received:	Pending	Accreditation renewal:	Pending
External Accreditor 2:	Institution of Civil Engineers (ICE)		
Accreditation received:	Pending	Accreditation renewal:	Pending
External Accreditor 3:	The Institution of Structural Engineers (IStructE)		
Accreditation received:	Pending	Accreditation renewal:	Pending
External Accreditor 4:	Institute of Highway Engineers (IHIE)		

Accreditation received:	Pending	Accreditation renewal:	Pending
External Accreditor 5:	The Chartered Institute of Highways & Transportation (CIHT)		
Accreditation received:	Pending	Accreditation renewal:	Pending
External Accreditor 6:	The Permanent Way Institution (PWI)		
Accreditation received:	Pending	Accreditation renewal:	Pending
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 Sue Grimes	
Student cohorts covered by specification		2025-26 entry	
Date of introduction of programme		October 2023	
Date of programme specification/revision		January 25	

Programme Overview

Imperial College London is a world-leading research institution, and our Department is a world leading Civil and Environmental Engineering research department. The Environmental Engineering Cluster MSc programme in Environmental Engineering (EE) has a long history in the Department of Civil and Environmental Engineering, dating back to 1950, so on joining our programme you will become part of a long tradition of several hundred graduates who have benefitted from the teaching and training delivered by the Section. The programme provides for both engineers and scientists, a rigorous treatment of the fundamental principles and practices of assessing and protecting the environment and human health.

The EE programme is a vocational programme, central to which are the concepts of sustainability and delivery of engineered solutions to conserve resources and protect the environment and human health. The programme deals with major topics in the provision of environmental services such as water supply, wastewater treatment, municipal solid waste and hazardous waste management and resource conservation and recovery as applied to both developed and developing countries. Distinctive features of this programme include its broad coverage of problems and issues concerned with the supply of clean water, sustainable resource management and pollution control; a clear focus on providing the underlying science and technology to develop and understand engineering solutions to these problems; and opportunities to carry out research in key areas of environmental engineering related to the specialism, and linked to industry, as part of national and international research projects. 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.

The Data Science (DS) stream provides a unique opportunity for our Environmental Engineering students taking this option to specialise in areas that have become critical to meeting industry and business needs in the water, waste and resource, energy and decarbonization sectors. Data science is central to the design and operation of modern resilient, sustainable environmental engineering systems. Distinctive features of this option are to provide a concise and comprehensive introduction to key scientific methods of statistical analysis and data modelling from both a theoretical and applied viewpoint, and skills to apply emerging machine learning methods to solve complex environmental engineering applications and aid decision-making in stakeholder environments. The Design Project offers the experience of working in a team on a client-based project drawing on knowledge from the core modules delivered in statistical modelling, machine learning, along with practical advanced computational skills derived from the data engineering module and their application in a real-world scenario.

The programme is structured in three parts. A programme plan is set out in the schematic below (Figure 1) to show the modification of the core Environmental Engineering programme to accommodate the four modules of the new option programme, and to show the relationship between the two programmes being offered. The taught component of the programme is delivered in two parts, during the Autumn and Spring Terms. In the Autumn term you will acquire core knowledge in the topics of fundamental importance in environmental engineering and in topics of importance in data science (specifically statistical modelling and machine learning) and in the Spring Term the programme content is more applied and shows how your core knowledge can be used to address environmental engineering challenges and solve a range of complex civil and environmental engineering problems. Assessment is by examination and coursework of the content taught during these terms. Examinations take place at the beginning of the Spring Term and at the beginning of the Summer Term. During the third part of the programme, you will work on your individual research project over period of 15 weeks, with submission normally at the end of August.

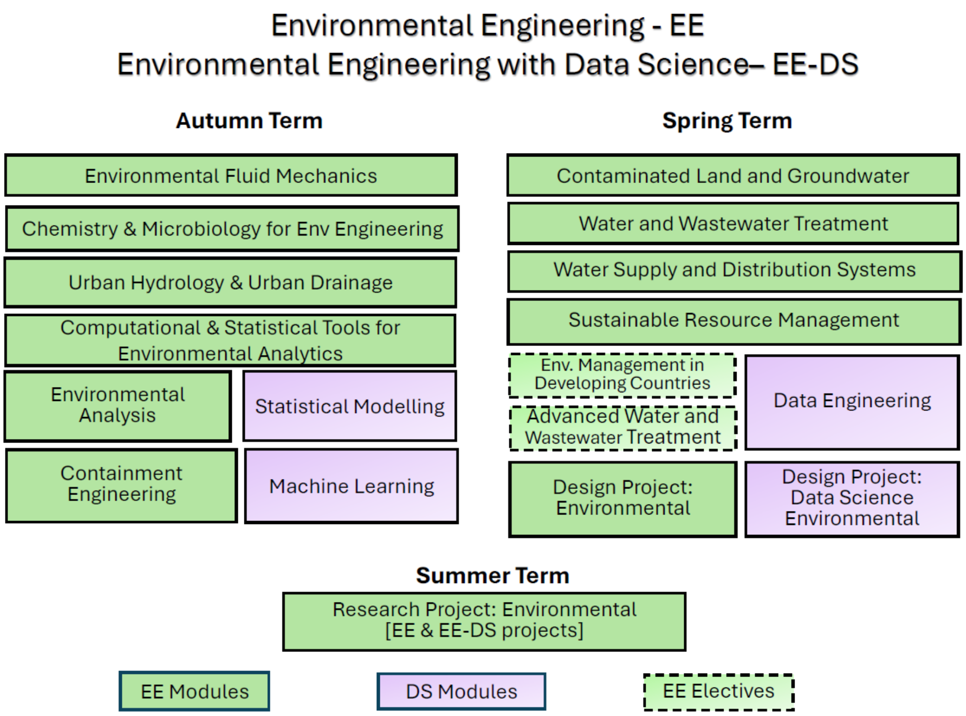

Figure 1: Schematic of the Environmental Engineering Programmes

Throughout the programme there are many opportunities for you to work on your own as well as part of a team in group work; experiences which test your communication, leadership, and interpersonal skills as well as your technical competence, time, and project management skills.

The Environmental Engineering programme is pending accreditation by the Joint Board of Moderators (JBM) and the Subject Threads of Sustainability, Design, and Health and Safety are embedded in modules that make up the taught programme, the individual and group design projects, and the individual research projects.

The Environmental Engineering with Data Science programme benefits from teaching and project supervision delivered by research-leading academics of long-standing, with backgrounds in chemistry, biology, materials, systems engineering, statistical modelling, machine learning and data engineering, as well as civil engineering. The diversity of background amongst the staff is reflected in the extensive and diverse portfolio of research and the experience many have had in leading roles in national and international research activity, providing advice and guidance to UK and overseas governments and international agencies, and industry. The teaching is supported by an extensive contribution from industry and business practitioners as well as overseas academics.

Graduates from our MSc programmes find employment in public, private and third sector organisations - consultancies, industry, business, and government bodies worldwide, or engage in PhD research in academic institutions in the UK and abroad. Many of our graduates are head-hunted through our alumni network.

Learning Outcomes

On completion of the MSc Environmental Engineering programme with Data Science, you will be able to:

1. Apply knowledge of the principles of chemistry and microbiology in the context of environmental engineering problems for example in the provision of safe, potable and ample public water supplies, the treatment of wastewater and solid waste, and the control of water, soil and atmospheric pollution.
2. Use computational methods and statistical modelling techniques for handling complex environmental datasets and interrogation of real-world data to aid decision-making in selection of optimal strategies for application in a stakeholder environment.
3. Apply machine learning models to solve complex ‘environmental’ engineering applications.
4. Interpret regulatory frameworks and best practice methods for compliance within different environmental sectors.
5. Design protocols and process criteria to aid judgements on data integrity for the selection of appropriate methodologies and technologies for application.
6. Identify and evaluate appropriate technologies and management practices for application in developing countries.
7. Develop the scope and an appropriate machine learning approach, from a design brief, to solve complex engineering design problems, working effectively as a group.
8. Conduct a piece of independent research, setting out a project brief and research plan within a defined timeframe and available resources, applying data science skills that demonstrate a contribution to knowledge in a research area of interest.
9. Interpret state-of-the-art technical and scientific publications related to a research topic and demonstrate a critical attitude towards the results of others as well as their own.
10. Produce, as a written output, a research paper which presents in a coherent manner the aims/research content, a literature review, research methodology, research results, discussion and conclusions concisely written in the style of a scientific publication.

On completion of the PG Diploma in Environmental Engineering with Data Science you will be able to:

Either[1]:

1. Apply knowledge of the principles of chemistry and microbiology in the context of environmental engineering problems for example in the provision of safe, potable and ample public water supplies, the treatment of wastewater and solid waste, and the control of water, soil and atmospheric pollution.
2. Use computational methods and statistical modelling techniques for handling complex environmental datasets and interrogation of real-world data to aid decision-making in selection of optimal strategies for application in a stakeholder environment.
3. Apply machine learning models to solve complex ‘environmental’ engineering applications.
4. Interpret regulatory frameworks and best practice methods for compliance within different environmental sectors.
5. Design protocols and process criteria to aid judgements on data integrity for the selection of appropriate methodologies and technologies for application.
6. Identify and evaluate appropriate technologies and management practices for application in developing countries.
7. Develop the scope and an appropriate machine learning approach, from a design brief, to solve complex engineering design problems, working effectively as a group.

Or[2]:

1. Apply knowledge of the principles of chemistry and microbiology in the context of environmental engineering problems for example in the provision of safe, potable and ample public water supplies, the treatment of wastewater and solid waste, and the control of water, soil and atmospheric pollution.
2. Use computational methods and statistical modelling techniques for handling complex environmental datasets and interrogation of real-world data to aid decision-making in selection of optimal strategies for application in a stakeholder environment.
3. Apply machine learning models to solve complex ‘environmental’ engineering applications.

[1] Corresponds to Autumn and Spring term modules
[2] Corresponds to Autumn and Summer term modules.

4. Interpret regulatory frameworks and best practice methods for compliance within different environmental sectors.

and

8. Conduct a piece of independent research, setting out a project brief and research plan within a defined timeframe and available resources, applying data science skills that demonstrate a contribution to knowledge in a research area of interest.
9. Interpret state-of-the-art technical and scientific publications related to a research topic and demonstrate a critical attitude towards the results of others as well as their own.
10. Produce, as a written output, a research paper which presents in a coherent manner the aims/research content, a literature review, research methodology, research results, discussion and conclusions concisely written in the style of a scientific publication.

On completion of the PG Certificate in Environmental Engineering with Data Science you will be able to[3]:

1. Apply knowledge of the principles of chemistry and microbiology in the context of environmental engineering problems for example in the provision of safe, potable and ample public water supplies, the treatment of wastewater and solid waste, and the control of water, soil and atmospheric pollution.
2. Use computational methods and statistical modelling techniques for handling complex environmental datasets and interrogation of real-world data to aid decision-making in selection of optimal strategies for application in a stakeholder environment.
3. Apply machine learning models to solve complex 'environmental' engineering applications.
4. Interpret regulatory frameworks and best practice methods for compliance within different environmental sectors

The Imperial Graduate Attributes are a set of core competencies which Imperial expects students to achieve through completion of any Imperial degree programme. In accordance with these core competencies, set out below, our aim is for our graduates to:

- Demonstrate deep conceptual understanding of their chosen discipline
- Work effectively in multi-cultural, international teams and across disciplinary boundaries
- Approach challenges with curiosity, critical-thinking and creativity
- Innovatively apply their skills to tackling complex real-world problems
- Understand and value different cultures and perspectives
- Have developed into independent learners with high self-efficacy
- Display a strong sense of personal and professional identity

Entry Requirements	
Academic Requirement	Applicants are required to hold a 1st class UK Bachelor's or Master's Degree with Honours in Civil Engineering, other branches of Engineering, Natural Sciences, Earth Sciences, or other numerate discipline *(or a comparable qualification recognised by the university).* Students must have a background in Mathematics including algebra and multivariate calculus. Mathematics taught in typical STEM degrees would satisfy this requirement. For further information on entry requirements, please go to www.imperial.ac.uk/study/apply/postgraduate-taught/entry-requirements/accepted-qualifications/
Non-academic Requirements	Relevant industrial/professional experience may also be considered. Special cases, based on relevant experience, may be considered in some circumstances.

[3] Corresponds to Autumn term modules.

English Language Requirement	[Standard requirement (PG)](#) Please check for other [Accepted English Qualifications](#)
Admissions Test/Interview	Applicants may be invited for a face-to-face or telephone interview with the Course Directors. No additional entry assessments are required.

The programme's competency standards documents is available at: www.imperial.ac.uk/civil-engineering/prospective-students/postgraduate-taught-admissions/competence-standards/

Learning & Teaching Approach

Learning and Teaching Delivery Methods

The student cohorts join our cluster programmes in Environmental Engineering and Environmental Engineering with Data Science from many different backgrounds across the disciplines of science and engineering and this richness in diversity is valued and exploited to benefit the learning experience of each student. Opportunities for students to learn from one another is encouraged from the outset. This begins with an excellent Induction Programme where students, on first meeting, are allocated into groups (set up to balance gender, academic background, culture and chosen specialism for their degree) to work through challenge questions as a team and present their views in a Powerpoint presentation. This initial step sets our expectations of the cohort as an integrated group and underpins the inclusive teaching and learning that lies at the heart of our programme delivery to enable participation, remove barriers, encourage individuals to voice their views, and to build the strength of the student cohort as individuals who will emerge as our future ambassadors.

Students will experience different learning and teaching delivery methods, many of which will draw from those cited in Imperial's Educational Development Unit's teaching toolkit, but will most likely include:

- **Lectures:** are typically delivered to the entire class ranging from 2-3h in length as timetabled. Lectures will be delivered as traditional style lectures, flipped classroom, online learning supported through pre-recorded lectures. Most lectures involve student engagement with questions posed to the class and, in others, a lecturer may include breaks to allow for small-group exercises or discussions to reinforce learning of the recently covered material.
- **Tutorials:** these sessions will involve problem-solving exercises as individuals or as groups, which will allow students to apply the knowledge from the lectures. In many of these tutorial sessions there will be support from the department's group of trained graduate teaching assistants (GTAs) – this will involve you either being assigned a GTA as you work in groups, or you may be expected to ask questions of a team of GTAs. Aside from these more formal sessions, you may be set tutorial exercises to aid your learning, and to test your knowledge, which you can work through in your independent study time.
- **Online Quizzes:** these will be deployed in some modules where you will have the opportunity of testing your knowledge through short online exercises and quizzes. These exercises are used as part of formative learning and assessment, where some will be for credit and other just for practice; for you to test your understanding of concepts taught and your ability to build on and apply that knowledge.
- **Computer Sessions:** to train you in programming and the use of specialist software appropriate timetabled sessions will be run from our Computer room facilities. These sessions are often supported by a team of GTAs to assist you in your learning.
- **Group Exercises and Design Projects:** given the multidisciplinary nature of Environmental Engineering, as engineering graduates from this programme of Environmental Engineering with Data Science, you will rarely work in isolation, but instead will most likely operate in multi-cultural, international teams and across disciplinary boundaries so the importance of developing leadership and team-building skills cannot be underestimated. To develop and strengthen these skills throughout the programme there will be opportunities for you to work in groups on pieces of coursework and significantly in the Design Project Module. These opportunities will help you hone your skills, as a team player, of listening, cooperation, sharing, respect for, and empowerment of team members, and of exercising effective project and time-management. In your Design project these skills will be further enhanced through the experience of working with industry clients.
- **Individual Research Project:** Imperial is a world-leading research institution, and our Department is a world leading Civil and Environmental Engineering research department. The MSc programme you are joining has a history in the department spanning 70 years, so in the final 'trimester' of your degree programme you will have the opportunity to work for a period of up to 15 weeks on a research project of your choice, supervised by one or more members of our academic staff (and in many cases linked with industry), who are leaders of international renown in their field of research. This will allow you to undertake

in-depth research in areas of interest to you, be exposed to state-of-the art knowledge and develop analytical and communication skills to effectively present your research findings and deliver a research output that makes a contribution to knowledge.

As part of the learning and teaching delivery you will be encouraged to be creative in the art of communication in both written and oral presentations, and during the programme you will be challenged to produce different types of output for assessment that rely on your communication skills. Some of the formats will be familiar to you, whilst others will be new, but each will add to a portfolio of skills that will benefit you as you graduate from the programme. These different formats will include:

- Essay
- Executive Summary
- Group Report
- Powerpoint Presentations
- Oral Presentations
- Programming code
- Summary reports
- Individual Research Dissertation (written in the style of a Research Paper)
- A Research Poster

Overall Workload

Your overall workload consists of face-to-face sessions, some video-assisted training in laboratory methods 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.

In the first two terms you will spend about 25% of your time on lectures, tutorials, group work, and the remaining 75% of your time on independent study. The research dissertation includes a suite of project induction lectures and data-search training with the remainder (96% time) as independent study.

Assessment Strategy

Assessment Methods

To complete the requirements of the degree, all assessments must be undertaken to the appropriate level and will include the following:

- Individual and group coursework assignments
- A Timed PC assessment
- Group projects and presentations
- Design projects
- Written examinations
- A Research Dissertation
- A Research Poster

The Department aims to use a range of summative and formative assessment methods to maximise student learning. Summative assessment refers to those forms of assessment set out above that will test your achievement of module objectives, allow you to demonstrate that you have met the intended learning outcomes of each module and contribute towards the programme-level intended learning outcomes. To support you to identify areas of strengths and weaknesses to improve your learning, during the programme, we have a range of formative assessments such as problem-solving exercises (in-class and for self-study), online quizzes, etc.

The balance of the summative assessment across the programme is as follows

Coursework	57%
Exams	43%

Academic Feedback Policy

The assessment of our programmes is designed to include a wide range of assessment types, including examinations, group and individual coursework assignments, essays, executive summaries, oral presentations, online tests/quizzes, design projects, a research dissertation and a research poster. Feedback will be provided to you formally via methods appropriate to the assessment, as detailed below. Feedback will be provided to you in a timely manner, to an appropriate level of detail so that you can benefit from the comments, act on them, and feed forward this knowledge to the completion of other assignments and pieces of work. The following are the mechanisms in place for providing prompt feedback to students on their performance in coursework and examinations and processes for monitoring: • Coursework, marked and annotated by academic staff, is normally returned to students (individually) or for group work, to a group, (as appropriate) to a two-three week return schedule. Marking is done, sometimes with the assistance of trained GTAs. • Academic staff may also provide verbal feedback in class, post general feedback via Blackboard or distribute written overviews. • Provisional feedback, in grade format, on examination/assessment performance in a module is given to students, normally within 6-8 weeks of the examinations (in March and July), by the Examinations Officer. The Chair of the Board and Examinations Officer schedule individual meetings with those students who have borderline performance or fail modules. • Feedback on Research Dissertations is given throughout the period of research from the supervisor(s) and a written feedback summary will be provided to students individually, after the Board of Examiners' Meeting. 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
N/A	N/A	N/A

Programme Structure[4]					
Year 1 - FHEQ Level 7 **You will study all core and compulsory modules.**					
Code	Module Title	Core/ Compulsory/ Elective	Group	Term	Credits
CIVE70042	Environmental Fluid Mechanics	Compulsory		Autumn	5
CIVE70116	Statistical Modelling	Compulsory		Autumn	5
CIVE70046	Urban Hydrology and Urban Drainage	Compulsory		Autumn	5
CIVE70111	Machine Learning	Compulsory		Autumn	5
CIVE70040	Chemistry and Microbiology for Environmental Engineering	Compulsory		Autumn	5
CIVE70129	Computational and Statistical Tools for Environmental Analytics	Compulsory		Autumn	5
CIVE70031	Contaminated Land and Groundwater	Compulsory		Spring	5
CIVE70122	Data Engineering	Compulsory		Spring	5
CIVE70088	Design Project: Data Science – Environmental	Core		Spring	5
CIVE70057	Water Supply and Distribution Systems	Compulsory		Spring	5
CIVE70055	Water and Wastewater Treatment	Compulsory		Spring	5
CIVE70053	Sustainable Resource Management	Compulsory		Spring	5
CIVE70058	Research Project – Environmental	Core		Summer	30
				Credit Total	90

[4] **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 and Classification for Postgraduate Students **Award of a Postgraduate Certificate (PG Cert)** To qualify for the award of a postgraduate certificate you must have a minimum of 30 ECTS credits at Level 7 **Award of a Postgraduate Diploma (PG Dip)** To qualify for the award of a postgraduate diploma you must have passed modules to the value of no fewer than 60 credits at Level 7. 1. and no more than 10 ECTS credits as a Compensated Pass; **Award of a Masters Degree** 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 10 ECTS credits* as a Compensated Pass; 3. met any specific requirements for an award as outlined in the approved programme specification for that award. * **Note:** The programme is JBM-accredited (Pending) and no more than 10 credits as a Compensated Pass are permitted. **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 weighted average mark in the designated 'taught' and 'research' aspects of the programme each 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
As an accredited programme (pending TBC), students are subject to the standards set by the UK Engineering Council in relation to compensation: a maximum of 10 ECTS credits can be compensated across the entire programme.

Supporting Information
The Programme Handbook is available at: www.imperial.ac.uk/civil-engineering/prospective-students/handbooks/
The Module Handbook is available at: www.imperial.ac.uk/civil-engineering/prospective-students/postgraduate-taught-admissions/environmental-engineering-cluster/syllabus/
Imperial's entry requirements for postgraduate programmes can be found at: 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
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/university-governance-structure/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.