

Programme Information		
Programme Title	Programme Code	HECoS Code
General Structural Engineering with Data Science	H2A11	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 - H2A11D	N/A	N/A	N/A	60	120
PG Certificate - H2A11C	N/A	N/A	N/A	30	60

The PG Certificate/PG Diploma are exit awards and are not available for entry. You must apply to and join the MSc. The Diploma of Imperial College London (DIC) is awarded with successful completion of the MSc programme.

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 Engineering
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:	The Institution of Structural Engineers (IStructE)		
Accreditation received:	Pending	Accreditation renewal:	Pending
External Accreditor 3:	Institution of Civil Engineers (ICE)		
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	Dr Anton Köllner		
Student cohorts covered by specification	2024-25 entry		
Date of introduction of programme	2003		
Date of programme specification/revision	November 23		

Programme Overview
<p>The MSc programmes in Advanced Structural Engineering provide advanced training in the design, analysis, assessment and evaluation of concrete, steel and composite structures, including bridges and buildings. These programmes are career-oriented and cover the theoretical background and practical design considerations. The programmes are suitable for both practicing engineers with several years' experience and recent graduates.</p> <p>The MSc in General Structural Engineering with Data Science combines the strength in fundamental structural engineering provided by our successful MSc in General Structural Engineering programme with elements of data science that reflect the evolution of approaches within in the field of structural engineering. The Data Science stream provides a unique opportunity for our Structural Engineering students taking this option to specialise in areas that have become critical to meeting industry and business needs in the structural engineering sector. Data science is central to the design and operation of resilient, sustainable, and robust structures. 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 and statistical modelling to solve complex structural engineering problems and aid decision-making for clients and stakeholders. 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, and data engineering and their application in a real-world scenario.</p> <p>The programme is structured in three parts. The taught component of the programme is delivered over two parts, during the Autumn and Spring terms. In the Autumn term you will acquire core knowledge in the topics of fundamental importance to both structural engineering and data science, and will also undertake an elective module that may reflect your individual interests. In the Spring term the programme content is more applied, but you will still be exposed to compulsory modules related to mainstream structural engineering and data science. In the Spring term you will also complete your core data science focussed Design Project where you apply the data science techniques you have acquired to realistic structural engineering applications. Assessment of the taught modules is by examination and coursework of the content delivered during these terms. All teaching takes place at the South Kensington campus. 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, throughout the Summer term, you will undertake your</p>

'design project' (either a detailed design project, or a research dissertation) and you will work on this over a period of 13 weeks, with submission normally at the end of August. The design project is undertaken at Imperial and in some cases in collaboration with industry. 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. Both options involve a significant component of research, and while your detailed design project or dissertation does not have to have a data science focus, it will be an excellent opportunity to apply the skills you have acquired over the taught elements of the programme. The full-time programme is taken over 12 months, with a single entry point per year at the beginning of October.

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 programmes are pending accreditation by the Joint Board of Moderators (JBM).

The General Structural Engineering programmes benefit from teaching and project supervision delivered by research-leading academics of long-standing, with backgrounds in structural engineering, as well as more general 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.

Graduates from our MSc programmes are equipped to pursue careers in structural engineering design and analysis in industry, the public sector and non-governmental organisations, 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 General Structural Engineering with Data Science degree programme, you will be able to:

1. Identify suitable theoretical, analytical, or numerical procedures and apply these to a given structural analysis problem
2. Apply appropriate structural analysis approaches and loading protocols (such as those specified in Eurocode 1) to calculate the demands upon structural elements
3. Design and detail structural elements and connections to satisfy multi-objective design criteria; and particularly identify appropriate clauses within Eurocode 2 (Concrete) and Eurocode 3 (Steel) for the design or assessment of reinforced concrete and steel structures
4. Critically evaluate, select from, and apply a range of problem-solving strategies and tools to formulate design processes for complex structural engineering problems in a self-directed manner
5. Justify the selection of a particular structural material (*e.g.*, timber, concrete, masonry, steel, *etc*) as the optimal structural material for a given application, whilst taking due consideration for mechanical, economic, and environmental performance
6. Use computational methods and statistical modelling techniques for interrogation of real-world data to aid decision-making in selection of optimal strategies for application in a stakeholder environment
7. Apply machine learning models to solve complex structural engineering problems
8. Develop the scope and an appropriate machine learning approach, from a design brief, to solve complex engineering design problems, working effectively as a group
9. Defend proposals considered within a conceptual design phase and recommend, with justification and through the effective communication of both individual and collective views, an optimal solution for a conceptual design project
10. Conduct a piece of independent research (outlined in a project brief) within a defined timeframe and using available resources. Interpreting state-of-the-art technical and scientific publications related to the research topic and demonstrating a critical attitude towards the results of others as well as your own
11. Produce, as a written output, either a detailed design project or a research dissertation.

On completion of the Postgraduate Certificate (PG Cert) you will be able to fulfil either the learning outcomes 1-7 (corresponding primarily to the Autumn term modules) or 9-11 (corresponding to the Summer project).

On completion of the Postgraduate Diploma (PG Dip) you will be able to fulfil either the learning outcomes 1-8 (corresponding to the Autumn and Spring term modules, and including the data science focused Design Project) or 1-7 (corresponding primarily to the Autumn term modules) and 9-11 (corresponding to the Summer project).

The Imperial Graduate Attributes are a set of core competencies which we expect students to achieve through completion of any Imperial degree programme. The Graduate Attributes are available at: www.imperial.ac.uk/about/education/our-graduates/

Entry Requirements

Academic Requirement	<p>Applicants are required to hold a 1st class UK Bachelor's Degree with Honours in Civil Engineering (or a comparable qualification recognised by the university); other branches of Engineering, Natural Sciences, Earth Sciences or other numerate discipline are also considered on an individual basis.</p> <p>Students must have a background in Mathematics including algebra and multivariate calculus. Mathematics taught in typical STEM degrees would satisfy this requirement.</p> <p>Relevant industrial/professional experience may also be considered.</p> <p>For further information on entry requirements, please go to: www.imperial.ac.uk/study/pg/apply/requirements/pgacademic</p>
Non-academic Requirements	<p>Relevant industrial/professional experience may also be considered. Special cases, based on relevant experience, may be considered in some circumstances. Such candidates may be invited for interview as part of their application.</p>
English Language Requirement	<p>Standard requirement (PG) Please check for other Accepted English Qualifications</p>
Admissions Test/Interview	<p>Applicants may be invited to interview with one or more members of staff.</p>

The programme's competency standards documents can be found at: <https://www.imperial.ac.uk/civil-engineering/prospective-students/postgraduate-taught-admissions/competence-standards/>

Learning & Teaching Approach

Learning and Teaching Delivery Methods

You will be exposed to a range of teaching methods across the taught modules delivered over the Autumn and Spring terms, with the majority of the contact hours following a traditional lecture, with a follow up tutorial format. Computer laboratory sessions will be held as appropriate, and will be fundamental to the presentation of numerical tools used within Data Science. You will also have the opportunity to attend research seminars hosted by the Advanced Structural Engineering 'cluster or section' within the department. Group activities (both formally assessed, and informally conducted) benefit from the diverse international educational and cultural backgrounds of your peers and teaching staff.

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, or 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 you 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:** as graduates from these programmes, 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 may be further enhanced by working with industry.
- **Individual Design Project/Research Project:** Imperial is a world-leading research institution, and our Department is a world-leading Civil and Environmental Engineering research department. In the final part of your degree programme you will have the opportunity to work for a period of up to 13 weeks on an individual design or research project of your choice, supervised by one or more members of our academic staff (and sometimes 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 design or research output that makes a contribution to knowledge.

Independent learning is supported through the e-learning facilities (Blackboard Learn, VLE) as well as through online assignments and coursework. E-learning approaches are also adopted to conduct peer assessment, record lectures, and engage with interactive content using tools such as Mentimeter.

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 programmes. These different formats will include:

- Individual and group technical reports
- Slide-based presentations
- Oral presentations
- Programming code
- Summary reports
- Individual research dissertation or detailed design project (with detailed drawings)

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.

Typically, in the first two terms you will spend approximately 25% of your time on timetabled activities (lectures, tutorials, computer laboratories), amounting to around 400 hours. The remainder of your time (~75%) will be

devoted to independent study and preparation for examinations. Over the Summer term, over the first two weeks you will be engaged in your group conceptual design projects. Thereafter you will be 100% involved in independent study (but including regular interactions with you supervisor or project leader). For those undertaking a detailed design project as an alternative to a research project, the first few weeks of the Summer term will include timetabled sessions were multiple students engage with common elements of the design project.

Assessment Strategy

Assessment Methods

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

- Individual and group coursework assignments
- Written examinations
- A research dissertation or detailed design project
- Group conceptual design project
- Group projects and presentations

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), tutorials, online quizzes, *etc.* The balance of the summative assessment across the programme is as follows:

Coursework	25%
Exams	75%

The above breakdown considers the exam/coursework split for the compulsory and core modules along with a representative split over the elective modules available.

Academic Feedback Policy

The following are the mechanisms in place for providing prompt feedback to students on their performance in coursework and examinations and processes for monitoring:

1. All coursework is summative as defined by the weighting attached to these assessments. Its primary function is to measure your learning and understanding of the module in question, while preparing you for the written examination to follow, or assessing skills that cannot be evaluated through a written examination. As a result, coursework submission deadlines tend to be clustered towards the end of the teaching term (when your comprehension and skillsets are most developed), with the feedback following the examination period. In this way, we try to ensure that you focus on learning the subject rather than simply looking at it from the perspective of marks achieved. Coursework is marked and annotated by academic staff, sometimes with the assistance of trained GTAs. Where possible, we aim to provide feedback to students within a three-week return schedule.
2. Academic staff may also provide verbal feedback in class or distribute written overviews.
3. Provisional feedback, in grade format, on examination/assessment performance is given to students, within eight weeks, by the Examinations Officer.

In addition to the above mechanisms, your overall performance across your taught modules will be discussed in one-to-one sessions with your personal (pastoral) tutor. These tutors do not provide subject specific academic guidance, but can help with your approach to study, time management, and examination preparation. They are also on-hand to discuss your examination performance once you obtain the marks from your Autumn term exams so that you are best-placed to approach your Spring term exams.

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/

Important notice: The Programme Specifications are the result of a large curriculum and pedagogy reform implemented by the Department and supported by the Learning and Teaching Strategy of Imperial College London. The modules, structure and assessments presented in this Programme Specification are correct at time of publication but might change as a result of student and staff feedback and the introduction of new or innovative approaches to teaching and learning. You will be consulted and notified in a timely manner of any changes to this document.

Programme Structure ¹					
Year 1 – FHEQ Level 7 You will study six modules in the Autumn term, and six modules in the Spring Term, and the research project in the Summer term. For the Autumn term, you will study all five compulsory modules and one elective module from Group A. For the Spring term, you will study three compulsory modules, one core module, and two elective modules from Group B.					
Code	Module Title	Core/ Compulsory/ Elective	Group	Term	Credits
CIVE70096	Structural Analysis	Compulsory		Autumn	5
CIVE70102	Reinforced Concrete I	Compulsory		Autumn	5
CIVE70097	Steel Components	Compulsory		Autumn	5
CIVE70116	Statistical Modelling	Compulsory		Autumn	5
CIVE70111	Machine Learning	Compulsory		Autumn	5
CIVE70012	Prestressed Concrete	Elective	A	Autumn	5
CIVE70090	Finite Element Analysis	Elective	A	Autumn	5
CIVE70095	Structural Dynamics	Elective	A	Autumn	5
CIVE70092	Structural Stability	Elective	A	Autumn	5
CIVE70006	Design of Timber and Masonry Structures	Elective	A	Autumn	5
CIVE70064	Cementitious Materials	Elective	A	Autumn	5
CIVE70091	Structural Steel Technology	Elective	A	Autumn	5
CIVE70061	Materials Selection	Elective	A	Autumn	5
CIVE70101	Reinforced Concrete II	Compulsory		Spring	5
CIVE70104	Design of Steel Buildings	Compulsory		Spring	5
CIVE70122	Data Engineering	Compulsory		Spring	5
CIVE70121	Design Project Data Science - Structures	Core		Spring	5
CIVE70066	Concrete Materials	Elective	B	Spring-Summer	5
CIVE70010	Nonlinear Structural Analysis	Elective	B	Spring	5
CIVE70103	Plated Structures	Elective	B	Spring	5
CIVE70105	Design of Bridges	Elective	B	Spring	5
CIVE70093	Structural Reliability Theory	Elective	B	Spring	5

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.

CIVE70014	Theory of Shells	Elective	B	Spring	5
CIVE70094	Structural Fire Engineering (not running in 2024-25)	Elective	B	Spring	5
CIVE70100	Research/Design Project - Structures	Core	C	Summer	30
				Credit Total	90

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 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 and no more than 10 credits as a Compensated Pass.

Award of a Postgraduate Degree (MSc programme)

To qualify for the award of a postgraduate degree a student must have:

1. accumulated credit to the value of no fewer than 90 credits at level 7;
2. and no more than 10* credits as a Compensated Pass;
3. the minimum module mark for which compensation is allowed is 40.00%;
4. met any specific requirements for an award as outlined in the approved programme specification for that award.
5. Satisfied the conditions stipulated in the Programme Specific Regulations

* The programme is JBM-accredited (pending) and no more than 10 credits as a Compensated Pass are permitted.

Classification of Postgraduate Taught Award

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 degree (pending TBC), students on this programme are subject to the standards set out 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/advanced-structural-engineering-cluster/msc-general-structures

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 s/he takes 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.