

Programme Information		
Programme Title	Programme Code	HECoS Code
Hydrology and Water Resources Management	H2UP	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 <a href="#">QAA Benchmark Statement(s)</a> and/or other external reference points	Master's Degrees in Engineering
<a href="#">FHEQ Level</a>	Level 7
<a href="#">EHEA Level</a>	2nd Cycle

External Accreditor(s) (if applicable)			
External Accreditor 1:	Joint Board of Moderators (JBM)		
Accreditation received:	2015	Accreditation renewal:	2026
External Accreditor 2:	<a href="#">Institution of Civil Engineers (ICE)</a>		
Accreditation received:	2002	Accreditation renewal:	2026
External Accreditor 3:	<a href="#">The Institution of Structural Engineers (IStructE)</a>		
Accreditation received:	2002	Accreditation renewal:	2026
External Accreditor 4:	<a href="#">Institute of Highway Engineers (IHIE)</a>		

Accreditation received:	2015	Accreditation renewal:	2026
External Accrerator 5:	<a href="#">The Chartered Institute of Highways &amp; Transportation (CIHT)</a>		
Accreditation received:	2005	Accreditation renewal:	2026
External Accrerator 6:	<a href="#">The Permanent Way Institution (PWI)</a>		
Accreditation received:	2021	Accreditation renewal:	2026
<b>Collaborative Provision</b>			
Collaborative partner	Collaboration type	Agreement effective date	Agreement expiry date
N/A	N/A	N/A	N/A
<b>Specification Details</b>			
Programme Lead	Professor Adrian Butler		
Student cohorts covered by specification	2023-24 entry		
Date of introduction of programme	October 21		
Date of programme specification/revision	August 23		

<b>Programme Overview</b>
<p>Imperial College London is a world-leading research institution, and our Department is a world leading Civil and Environmental Engineering research department. Hydrology and Water Resources Management (HWRM), which is one of two Environmental Engineering Cluster MSc programmes, has a long history in the Department of Civil and Environmental Engineering, dating back to 1955, 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 Environmental and Water Resource Engineering Section. The programme provides, for both engineers and scientists, a rigorous treatment of the fundamental principles and practices of water management and supply in the context of assessing and protecting the environment and human health.</p> <p>The HWRM programme is concerned with assessing the natural distribution of water and evaluating the impact of man-made changes on the distribution and quality of this water, in response to the increasing importance of water in food production, environmental sustainability and ecosystems services as well as concerns of flood protection and water supply. The programme draws on a number of physical and life sciences such as meteorology, plant physiology, soil physics and geology, and a number of mathematical sciences such as fluid mechanics, probability and statistics, and systems analysis in the context of (i) hydrological and water resource applications, (ii) techniques for the measurement and collection of data and the formulation of mathematical models of hydrological systems based on principles of physics, systems analysis and probability, (iii) applications of these models in solving such problems as flood estimation, water resources evaluation, and (iv) assessment of urbanisation effects and irrigation requirements. The planning and management of water resources are treated using the techniques of operational research. Water quality is considered as an important aspect of both surface and groundwater, and issues of point and non-point source pollution are included.</p> <p>The programme is structured in three parts. 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 to hydrological processes, measurement and analysis, whereas in the Spring Term the programme content is more applied and shows how your core knowledge can be used to address water-related challenges and problems. Assessment is by coursework and examination 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.</p>

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 Hydrology & Water Resources Management programme is accredited 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 Hydrology & Water Resources Management programme benefits from teaching and project supervision delivered by research-leading academics of long-standing, with backgrounds in hydrology, hydrogeology, physics, statistics, systems 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 Hydrology and Water Resources Management you will be able to:

1. Plan and critically assess the measurement and monitoring of hydrological data to interpret catchment processes and hydrological response.
2. Develop and use hydrological models, conditioned on hydrological and geological data, to assess and solve hydrological problems, such as: water resource management, flood prediction and design, environment impact assessment, contaminated land remediation, etc.
3. Apply critical analytical skills to different hydrological and environmental scenarios.
4. Interpret regulatory frameworks and best practice methods for compliance within different hydrological, environmental and water quality sectors.
5. Explain the role of climate on hydrological systems and evaluate the potential impacts of climate change on such systems.
6. Select and evaluate appropriate technologies and management practices for application to water resource management and water quality in developing countries.
7. Develop the scope and analytical process, 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, that demonstrates 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 Hydrology and Water Resources Management you will be able to:

#### Either<sup>1</sup>:

1. Plan and critically assess the measurement and monitoring of hydrological data in order to interpret catchment processes and hydrological response.
2. Develop and use hydrological models, conditioned on hydrological and geological data, in order to assess and solve hydrological problems, such as: water resource management, flood prediction and design, environment impact assessment, contaminated land remediation, etc.
3. Apply critical analytical skills to different hydrological and environmental scenarios.
4. Interpret regulatory frameworks and best practice methods for compliance within different hydrological, environmental and water quality sectors.

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<sup>1</sup> Corresponds to Autumn and Spring term modules.

5. Explain the role of climate on hydrological systems and evaluate the potential impacts of climate change on such systems.
6. Select and evaluate appropriate technologies and management practices for application to water resource management and water quality in developing countries.
7. Develop the scope and analytical process, from a design brief, to solve complex engineering design problems, working effectively as a group.

Or<sup>2</sup>

1. Plan and critically assess the measurement and monitoring of hydrological data in order to interpret catchment processes and hydrological response.
2. Develop and use hydrological models, conditioned on hydrological and geological data, in order to assess and solve hydrological problems, such as: water resource management, flood prediction and design, environment impact assessment, contaminated land remediation, etc.
3. Apply critical analytical skills to different hydrological and environmental scenarios.
4. Interpret regulatory frameworks and best practice methods for compliance within different hydrological, environmental and water quality sectors.

and

8. Conduct a piece of independent research, setting out a project brief and research plan within a defined timeframe and available resources, that demonstrates 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 Hydrology and Water Resources Management you will be able to<sup>3</sup>:

1. Plan and critically assess the measurement and monitoring of hydrological data in order to interpret catchment processes and hydrological response.
2. Develop and use hydrological models, conditioned on hydrological and geological data, in order to assess and solve hydrological problems, such as: water resource management, flood prediction and design, environment impact assessment, contaminated land remediation, etc.
3. Apply critical analytical skills to different hydrological and environmental scenarios.
4. Interpret regulatory frameworks and best practice methods for compliance within different hydrological, environmental and water quality sectors.

The Imperial Graduate Attributes are a set of core competencies which the College expects students to achieve through completion of any Imperial College 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

Normally a 2.1 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 College*).

<sup>2</sup> Corresponds to Autumn and Summer term modules.

<sup>3</sup> Corresponds to Autumn term modules.

	<p>Additionally, an A-level in Mathematics at grade B is required.</p> <p>For further information on entry requirements, please go to PG: <a href="http://www.imperial.ac.uk/study/apply/postgraduate-taught/entry-requirements/accepted-qualifications/">www.imperial.ac.uk/study/apply/postgraduate-taught/entry-requirements/accepted-qualifications/</a></p>
Non-academic Requirements	<p>Relevant industrial/professional experience may also be considered. Special cases, based on relevant experience, may be considered in some circumstances.</p>
English Language Requirement	<p><a href="#">Standard requirement (PG)</a> Please check for other <a href="#">Accepted English Qualifications</a></p>
Admissions Test/Interview	<p>Applicants may be invited for a face-to-face or telephone interview with the Course Directors. No additional entry assessments are required.</p>

The programme's competency standards documents can be found at: [www.imperial.ac.uk/civil-engineering/prospective-students/postgraduate-taught-admissions/competence-standards/](http://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 programme in Hydrology and Water Resources Management 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.

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The student cohorts join our programme in Hydrology and Water Resources Management 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.

Students will experience different learning and teaching delivery methods, many of which will draw from those cited in the College'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 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:** where 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 Hydrology, as engineering graduates from this programme, 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.

- **Individual Research Project:** Imperial College 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 take advantage of, by working for a period of 13-15 weeks on a research project of your choice, supervised by one or more members of our academic staff, 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.
- **Site Visits & Field Trips:** these are organised to enhance your learning, reinforce the knowledge you will have acquired in your lecture programme, and allow you to put that theoretical knowledge into practice. You will benefit from site visits to hydrological monitoring sites where you will undertake field measurements as well as site visits to hydrological institutions (such as the UK Centre for Ecology & Hydrology, the British Geological Survey and the European Centre for Medium Range Weather Forecasting). Visits will vary in duration from half-day trips (typically 3h in duration) to a period of 2-3 days which will involve travel to sites within the UK and overnight stays.

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:

- Executive Summary
- Group Report
- Individual Project Report
- PowerPoint Presentations
- Oral Presentations
- Programming code
- 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 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 20% of your time on lectures, tutorials, group work, and practical/field studies and the remaining 80% 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
- 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	49%
Exams	51%

#### 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, individual project reports, 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.

#### Re-sit Policy

The College's Policy on Re-sits is available at: [www.imperial.ac.uk/student-records-and-data/for-current-students/undergraduate-and-taught-postgraduate/exams-assessments-and-regulations/](http://www.imperial.ac.uk/student-records-and-data/for-current-students/undergraduate-and-taught-postgraduate/exams-assessments-and-regulations/)

#### Mitigating Circumstances Policy

The College's Policy on Mitigating Circumstances is available at: [www.imperial.ac.uk/student-records-and-data/for-current-students/undergraduate-and-taught-postgraduate/exams-assessments-and-regulations/](http://www.imperial.ac.uk/student-records-and-data/for-current-students/undergraduate-and-taught-postgraduate/exams-assessments-and-regulations/)

#### 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
3-day Field Trip	Mandatory	£400

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

Programme Structure <sup>4</sup>					
Year 1 - FHEQ Level 7 You will study all core and compulsory modules.					
Code	Module Title	Core/ Compulsory	Group	Term	Credits
CIVE70042	Environmental Fluid Mechanics	Compulsory		Autumn	5
CIVE70024	Hydrogeology and Groundwater	Compulsory		Autumn	5
CIVE70044	Meteorology and Climate Change	Compulsory		Autumn	5
CIVE70046	Urban Hydrology and Urban Drainage	Compulsory		Autumn	5
CIVE70039	Catchment Hydrology	Compulsory		Autumn	5
CIVE70043	Environmental Modelling and Data Analysis	Compulsory		Autumn	5
CIVE70031	Contaminated Land and Groundwater	Compulsory		Spring	5
CIVE70051	Design Project: Hydrology	Core		Spring	5
CIVE70045	Rainfall-Runoff Modelling and Flood Hydrology	Compulsory		Spring	5
CIVE70056	Water Quality Engineering and Ecohydrology	Compulsory		Spring	5
CIVE70054	Sustainable Water Management	Compulsory		Spring	5
CIVE70052	Stochastic Water Resources Management	Compulsory		Spring	5
CIVE70058	Research Project – Environmental	Core		Summer	30
Credit Total					90

<sup>4</sup> **Core** modules are those which serve a fundamental role within the curriculum, and for which achievement of the credits for that module is essential for the achievement of the target award. Core modules must therefore be taken and passed in order to achieve that named award. **Compulsory** modules are those which are designated as necessary to be taken as part of the programme syllabus. Compulsory modules can be compensated. **Elective** modules are those which are in the same subject area as the field of study and are offered to students in order to offer an element of choice in the curriculum and from which students are able to select. Elective modules can be compensated.



### **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 and no more than 10 credits as a Compensated Pass are permitted.

### **Classification of Postgraduate Taught Awards**

The College 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, 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/](http://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/](http://www.imperial.ac.uk/civil-engineering/prospective-students/postgraduate-taught-admissions/environmental-engineering-cluster/syllabus/)

The College's entry requirements for postgraduate programmes can be found at: [www.imperial.ac.uk/study/apply/postgraduate-taught/entry-requirements/accepted-qualifications/](http://www.imperial.ac.uk/study/apply/postgraduate-taught/entry-requirements/accepted-qualifications/)

The College's Quality & Enhancement Framework is available at: [www.imperial.ac.uk/registry/proceduresandregulations/qualityassurance](http://www.imperial.ac.uk/registry/proceduresandregulations/qualityassurance)

The College's Academic and Examination Regulations can be found at: [www.imperial.ac.uk/about/governance/academic-governance/regulations](http://www.imperial.ac.uk/about/governance/academic-governance/regulations)

Imperial College 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 the College's Centenary, 8th July 2007, established the College 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/](http://www.imperial.ac.uk/admin-services/secretariat/college-governance/charters/)

Imperial College London is regulated by the Office for Students (OfS)  
[www.officeforstudents.org.uk/advice-and-guidance/the-register/](http://www.officeforstudents.org.uk/advice-and-guidance/the-register/)

This document provides a definitive record of the main features of the programme and the learning outcomes that you may reasonably be expected to achieve and demonstrate if you take full advantage of the learning opportunities provided. This programme specification is primarily intended as a reference point for prospective and current students, academic and support staff involved in delivering the programme and enabling student development and achievement, for its assessment by internal and external examiners, and in subsequent monitoring and review.