Programme Information		
Programme Title	Programme Code	HECoS Code
Renewable Energy with AI and Data Science: Geology and Geophysics (READY)	F665	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 – F665D	9 months	N/A	N/A	60	120
PG Certificate – F665C	3 months	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.					

Ownership			
Awarding Institution	Imperial College London	Faculty	Faculty of Engineering
Teaching Institution	Imperial College London	Department	Earth Science and 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		Masters Awards in Engineering	
FHEQ Level		7	
EHEA Level		2nd Cycle	
External Accreditor(s) (if applicable)			
External Accreditor 1:	N/A		
Accreditation received:	N/A	Accreditation renewal:	N/A
Collaborative Provision			
Collaborative partner	Collaboration type	Agreement effective date	Agreement expiry date
N/A	N/A	N/A	N/A

Specification Details	
Programme Lead	Dr Rebecca Bell
Student cohorts covered by specification	2025-26 entry
Date of introduction of programme	October 25
Date of programme specification/revision	May 24

Programme Overview

The MSc in Renewable Energy with AI and Data Science: Geology and Geophysics (READY) degree will equip you with the geology, near-surface geophysics and computational skills needed to characterise the shallow subsurface for a broad range of renewable energy applications. To meet the global green energy targets, the number of offshore renewables projects has to increase dramatically over the next two to three decades. Offshore wind is one offshore renewable option, with wave and tidal expected to grow in importance as technology matures. This course will provide you with offshore data-collection experience and exposure to industry.

As part of a suite of MSc programmes, this programme differs to others offered within the Department of Earth Science and Engineering, since it takes you through a curriculum that will enable a deepening of knowledge and skills associated with cutting-edge data science, AI, machine learning and associated computational and observational techniques, and their application to characterisation of the subsurface for renewable energy applications. The programme is currently supported by a number of companies in the Renewables sector (including SSE, RWE, Ørsted, Vattenfall and Arup) who have contributed to curriculum development and will form an industry advisory board to ensure skills being taught match those required for the energy transition.

You will be expected to be familiar with computer programming using Python at the start and evidence of the use of Python in your application will be a selection criterion. We will offer and recommend that all successful applicants complete our pre-sessional training material online so that you can continue to review and refresh your knowledge before the start of the programme. During the MSc we will develop your knowledge through advanced programming classes and support you in your journey with formative feedback in the form of unassessed class quizzes for self-reflection and group activities. You will also learn data science, numerical methods and machine learning.

Throughout the programme, you will apply these concepts to problems in subsurface site characterisation for renewable energy applications, including sedimentary geology, geomorphology, geohazards for engineering, high-resolution geophysics, soil mechanics and geotechnics. You will work alongside other students working on applied computer science, data science and machine learning, in your classes and project work. For your summer research project, there will be the opportunity to take up optional placements in industry or conduct a project under the supervision of Imperial academics ‘in-house’. Company projects and ‘in-house’ projects will be advertised to all students and you will be asked to select your preferred projects in order or preference. You will be encouraged to talk to members of staff to help frame and decide on a suitable project. For some company hosted projects you will be asked to send your CV to company supervisors who will then select their preferred candidate. All company projects have an Imperial supervisor in addition to an industry supervisor. For projects allocated by Imperial an algorithm is used to allocate projects based on student preference and you will receive two Imperial supervisors. Students are not expected to find a company supervisor or develop a project themselves.

This programme will suit you if you have/are:

- a background in geology, geophysics or other geoscience subject, and wish to learn about data science and machine learning (the underlying theory/algorithms and how to implement/use them in code) and how these can be used as modern data-driven problem-solving and analysis tools in the renewables sector;

- a strong methodological background in engineering or physical sciences and are wishing to move to, or specialise in, an applied field with an emphasis on subsurface site characterisation for renewable energy applications;
- a professional in the renewables industry who would like to develop your skills in data science and machine learning or are a professional in the oil and gas industry wishing to transition to the renewables sector.

The programme consists of taught modules and project work delivered over the first two terms of the academic year, followed by a research project in the summer term and submitted at the end of the summer vacation. The taught modules will cover geoscience and geotechnics applied to site characterisation for renewables applications predominantly using datasets from industry. This will be integrated with the development of skills in data science, machine learning, and programming. Each module will explore examples and applications to renewables site characterisation problems within the industry today.

The programme will be based at Imperial's main South Kensington Campus in the Royal School of Mines. You will be taught by faculty experts in geoscience and engineering, as well as data science, computational methods and machine learning. Where appropriate the teaching will be supplemented by input from external experts in these areas. The faculty are also actively engaged in research in the Department of Earth Science and Engineering and will incorporate the latest research ideas and industry applications into the programme.

Based on previous cohorts of students from our existing suite of MSc progammes, approximately one-third go on to further study either another MSc programme or a PhD. The other two-thirds work mainly in industry. The principal employers of graduates from this programme will be the growing renewables industry (particularly offshore wind), including the companies who have already joined the consortium for curriculum development. After graduation, you could also find employment in large data and computer companies, consultancies offering services to the energy industry and working on natural geo-hazards, and the wider energy industry.

Learning Outcomes

On successful completion of the MSc in Renewable Energy Subsurface Characterisation with Data Science you will be able to:

1. Program in Python to solve numerical problems related to subsurface characterisation for renewable energy projects.
2. Apply modern data science and machine learning methods to analyse geological data for site characterisation.
3. Apply knowledge of sedimentary geology, geomorphology and paleoclimate to identify geohazards to renewables infrastructure.
4. Integrate high-resolution geophysical data and geotechnical data to develop ground models for infrastructure installation, utilising data science and machine learning.
5. Work independently to solve problems associated with subsurface characterisation, applying modern computational methods, machine learning and data science.
6. Work in interdisciplinary teams to tackle problems associated with subsurface characterisation.
7. 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.
8. Interpret state-of-the-art technical and scientific publications related to a research topic and critically evaluate the results of others.
9. Produce, as a written output, a research report/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 successful completion of the PG Diploma in Renewable Energy with AI and Data Science: Geology and Geophysics you will be able to:

1. Program in Python to solve numerical problems related to subsurface characterisation for renewable energy projects.
2. Apply modern data science and machine learning methods to analyse geological data for site characterisation.
3. Apply knowledge of sedimentary geology, geomorphology and paleoclimate to identify geohazards to renewables infrastructure.
4. Integrate high-resolution geophysical data and geotechnical data to develop ground models for infrastructure installation, utilising data science and machine learning.
5. Work independently to solve problems associated with subsurface processes, applying modern computational methods, machine learning and data science.
6. Work in interdisciplinary teams to tackle problems associated with subsurface characterisation.

On successful completion of the PG Certificate in Renewable Energy Subsurface Characterisation with Data Science you will be able to:

1. Program in Python to solve numerical problems related to subsurface characterisation for renewable energy projects.
2. Apply modern data science and machine learning methods to analyse geological data for site characterisation.
3. Apply knowledge of sedimentary geology, geomorphology and paleoclimate to identify geohazards to renewables infrastructure.
4. Integrate high-resolution geophysical data and geotechnical data to develop ground models for infrastructure installation, utilising data science and machine learning.

The Imperial Graduate Attributes are a set of core competencies which we expect students to achieve through completion of any Imperial degree programme. The Graduate Attributes are available at: https://www.imperial.ac.uk/about/education/our-graduates/
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	UG degree in any geological or physical science or engineering subject. The minimum requirement is a 2:1 with evidence of a good quantitative background (A-grade in mathematics A-level, or evidence of mathematics programmes at undergraduate level). Prior coding experience is important – you will need to demonstrate in your application your ability to cope with the numerical coding aspect of the programme – see below. For further information on entry requirements, please go to PG: www.imperial.ac.uk/study/pg/apply/requirements/pgacademic
Non-academic Requirements	Special cases, based on relevant industrial/professional experience, may be considered in some circumstances, at the discretion of the university. Applicants may be required to undertake a Special Qualifying Examination.

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 remote interview with the Programme Directors. Particular attention will be paid to programming skills. We highly recommend that all accepted applicants complete our online pre-sessional Python training material. No additional entry assessments are required.

Learning & Teaching Approach

Learning and Teaching Delivery Methods

- Lectures
- Seminars and practical coding activities
- One day offshore experience onboard a Port of London Authority vessel
- Case studies
- Group work exercises
- Individual research
- Formal presentations

All the module content will be available online. The lectures themselves will have a strong emphasis on skills development, where short lectures will be punctuated by individual or paired exercises with the support of teaching staff.

Individual and group projects will run throughout the year. These will be both analytical and problem-solving based, combined with computational and data analysis based projects with application to subsurface geoscience and engineering. These smaller projects also help prepare the student for the independent research project at the end of the year.

You will undertake a research project within a departmental research group or as a placement in industry.

Overall Workload
Your overall workload consists of face-to-face sessions and independent learning. At Imperial, each ECTS credit taken equates to an expected total study time of 25 hours. Therefore, the expected total study time is 2,250 (90 ECTS) hours per year.

The programme is structured with face-to-face teaching sessions in the morning, with the afternoons devoted to exercises and activities to support the mornings learning. These sessions will be supported by Graduate Teaching Assistants. This structure spans 9 months punctuated with three week-long project sessions where you will have the opportunity to work in teams or individually.

Three months will be devoted exclusively to the summer individual research project.

Assessment Strategy

Assessment Methods

A range of summative and formative assessment methods are used throughout the programme to maximise your learning. All summative assessment will be based on coursework with no formal written examinations.

Formative feedback to aid learning will be provided through the practical sessions that will run throughout each module. Model solutions to the practical work will be provided in the form of annotated Jupyter notebooks or word documents/pdfs. During lectures there will be a chance for students to self-reflect on their understanding thanks to informal quizzes using electronic voting tools like Mentimeter. During group project work feedback will be

provided in written form and orally by members of the faculty and graduate teaching assistants working on each module. During the final independent research project students will benefit from oral and written feedback from two supervisors (either one industry and one Imperial supervisor or two Imperial supervisors).

Summative assessment will be provided by at least two items of assessed coursework for each module which can be completed in class and at home. Dependent on the module, this may be a combination of written homework, solving problems, as well as numerical and coding exercises. For project work assessment will also be based on oral presentation of the work and from project reports. Individual feedback will be given to students on their assessed work as well as class feedback being provided either orally or in writing.

A final thesis and presentation will also be required for the summative assessment of the final summer research project. 80% of the total mark will be based on written material and 20% on a presentation and demonstration of the software developed.

In group project work, all team members will receive the same mark. Support for project work will be provided by graduate teaching assistants and faculty with tutorial staff available to guide you through team working.

Academic Feedback Policy
Feedback on coursework will be provided in line with the Imperial's Policy on Academic Feedback. The good practice guidelines of feedback being provided within two weeks of the submission date will be employed. Since all the assessment is coursework-based, students will receive provisional marks combined with written and oral feedback at the end of each module. Formative feedback to aid learning will be provided through the practical sessions that will run throughout each module. Model solutions to the practical work will be provided in the form of annotated Jupyter notebooks or word documents/pdfs. During lectures there will be a chance for students to self-reflect on their understanding thanks to informal quizzes using electronic voting tools like Mentimeter. During group project work feedback will be provided in written form and orally by members of the faculty and graduate teaching assistants working on each module. During the final independent research project students will benefit from oral and written feedback from two supervisors (either one industry and one Imperial supervisor or two Imperial supervisors). The final numerical marks will be provided by the Registry after the Board of Examiner's meeting at the end of the academic year. 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
There are no additional costs. The field trip costs are included.

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]					
FHEQ Level 7 **For the MSc you will need to complete all modules. There are no electives.**					
Code	Module Title	Core/ Compulsory/ Elective	*Group*	Term	Credits
EART70159	Numerical Programming in Python	Compulsory		Autumn	5
EART70160	Data Science and Machine Learning	Compulsory		Autumn	5
EART70161	Computational mathematics	Compulsory		Autumn	5
EART70162	Applying Computational/Data Science	Compulsory		Autumn, Spring, Summer	7.5
EART70167	Deep Learning	Compulsory		Autumn	7.5
EART70188	Subsurface Fundamentals and Renewable Energy Technologies	Compulsory		Spring	7.5
EART70189	Depositional Environments and Geohazards for Renewables Infrastructure	Compulsory		Spring	7.5
EART70190	Geomechanics and Geotechnics	Compulsory		Spring	7.5
EART70191	Geophysics, Data Integration and Ground Modelling	Compulsory		Summer	7.5
EART70168	Applied Computational/Data Science Project	Core		Summer, Late Summer	30
				Credit Total	90

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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 from the taught modules in the Autumn, Spring and Summer terms

1. and no more than 10 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 15 credits as a Compensated Pass;
3. met any specific requirements for an award as outlined in the approved programme specification for that award.

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 Programme Overall Weighted Average and the designated dissertation or final major project module 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

None

Supporting Information
The Programme Handbook is available from the department
The Module Handbook is available from the department
Imperial's entry requirements for postgraduate programmes can be found at: www.imperial.ac.uk/study/pg/apply/requirements
Imperial's Quality & Enhancement Framework is available at: www.imperial.ac.uk/registry/proceduresandregulations/qualityassurance
Imperial's Academic and Examination Regulations can be found at: www.imperial.ac.uk/about/governance/academic-governance/regulations
Imperial College London is an independent corporation whose legal status derives from a Royal Charter granted under Letters Patent in 1907. In 2007 a Supplemental Charter and Statutes was granted by HM Queen Elizabeth II. This Supplemental Charter, which came into force on the date of Imperial's Centenary, 8th July 2007, established Imperial as a University with the name and style of "The Imperial College of Science, Technology and Medicine". www.imperial.ac.uk/admin-services/secretariat/college-governance/charters/
Imperial College London is regulated by the Office for Students (OfS) www.officeforstudents.org.uk/advice-and-guidance/the-register/
This document provides a definitive record of the main features of the programme and the learning outcomes that you may reasonably be expected to achieve and demonstrate if you take full advantage of the learning opportunities provided. This programme specification is primarily intended as a reference point for prospective and current students, academic and support staff involved in delivering the programme and enabling student development and achievement, for its assessment by internal and external examiners, and in subsequent monitoring and review.