Programme Information		
Programme Title	Programme Code	HECoS Code
Advanced Computational Methods for Aeronautics, Flow Management and Fluid-Structure Interaction	H1U6	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 – H1U6D	N/A	N/A	N/A	60	120
PG Certificate – H1U6C	N/A	N/A	N/A	30	60
The PG Certificate and the PG Diploma are exit awards and not available for entry. You must apply to and join the MSc.					

Ownership			
Awarding Institution	Imperial College London	Faculty	Faculty of Engineering
Teaching Institution	Imperial College London	Department	Aeronautics
Associateship	Diploma of Imperial College (DIC)	Main Location(s) of Study	South Kensington
External Reference			
Relevant QAA Benchmark Statement(s) and/or other external reference points		Master's award in Engineering	
FHEQ Level		Level 7	
EHEA Level		2nd Cycle	
External Accreditor(s) (if applicable)			
External Accreditor 1:	Royal Aeronautical Society		
Accreditation received:	2020	Accreditation renewal:	2025
Collaborative Provision			
Collaborative partner	Collaboration type	Agreement effective date	Agreement expiry date
N/A	N/A	N/A	N/A
Specification Details			

Programme Lead	Prof. Sergei Chernyshenko
Student cohorts covered by specification	2025-26 entry
Date of introduction of programme	October 20
Date of programme specification/revision	August 23

Programme Overview

This advanced taught programme covers the major aspects of computational and theoretical fluid dynamics in application to aeronautical engineering, with a high-level of applicability to non-aeronautical disciplines as well. The programme equips the graduates with a fundamental understanding of the programme material and the skills needed to apply their theoretical knowledge to complex practical problems. The distinguished feature of the programme is that it ensures that you will have the ability to solve complex problems numerically, as opposed to simply using 'black box' commercial codes. As a result, you will be able to write and develop, rather than simply use, commercial packages. The second distinguishing feature is that the programme provides not only enhanced engineering training, but also encourages and provides opportunities for conversion to an advanced engineering discipline for graduates from disciplines such as Mathematics and Physics.

The degree is assessed by written examination, associated coursework, and a substantial individual research project. It may be possible for projects to be carried out in industry. The normal duration of the programme is one year full-time.

The taught modules are confined to the Autumn and Spring terms, with the associated examinations held in two stages; the first examination session is in the first two weeks of the Spring term, for modules taught in the preceding Autumn term. The second examination session takes place in the first two weeks of the Summer term for modules taught in the preceding Spring term.

Learning Outcomes

By the end of the MSc programme, you will be able to:

1. Apply the comprehensive knowledge and understanding of fundamental concepts and physical principles underlying CFD and structural analysis;
2. Evaluate and manipulate the relevant mathematics underpinning aeronautical engineering and associated computational methods;
3. Apply numerical analysis, programming and computational methods.
4. Critically evaluate advanced analytical concepts;
5. Apply programming and identifying solution strategies;
6. Plan, conduct and report on a programme of original research.
7. Write programs in a standard programming language.
8. Communicate effectively through report writing and data presentation;
9. Present results of individual research project in a lecture to staff and students;
10. Work effectively at an advanced level, to show independence and to manage time;
11. Incorporate an awareness of the environmental, economic and social impact in the design of current and emerging technologies

On completion of the PG Certificate, you will be able to:

1. Apply the comprehensive knowledge and understanding of the scientific, mathematical and computational principles, methods and models relevant to computational fluid dynamics;
2. Evaluate the current and developing (future) methods and technologies in, and relevant to, the field of computational fluid dynamics.

Upon completing the PG Diploma you will achieve the intended learning outcomes from the PG Certificate in addition to:

1. Plan, monitor and improve upon a programme of original research, including the ability to undertake effective self-learning and evaluate and improve personal performance and self-efficacy as the foundation for lifelong learning and continuous personal development.
2. Work effectively at an advanced level, to show independence and to manage time

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	At least a 2.1 (first strongly preferred) UK Bachelor's Degree with Honours or equivalent in engineering, mathematics, or physics or computing. PG: www.imperial.ac.uk/study/apply/postgraduate-taught/entry-requirements/accepted-qualifications/
Non-academic Requirements	None
English Language Requirement	Standard requirement (PG) IELTS score of 6.5 overall (minimum 6.0 in all elements) Please check for other Accepted English Qualifications
Admissions Test/Interview	N/A

The programme's competency standards documents can be found at: are available from the department.

Learning & Teaching Approach

Learning and Teaching Delivery Methods

You will be given access to optional pre-sessional revision modules which will consist of lecture recordings that you can work through in your own time, covering the following topics:

- Revision Stress Analysis
- Introduction to Programming
- Introductory Mathematics
- Control Theory
- Introduction to Compressible Flow
- Aircraft Performance and Flight Mechanics
- Introduction to Fluid Dynamics

These revision lectures will not be assessed and therefore do not count for credit. Formative, self-assessment (e.g. tutorial problem sheets with model solutions supplied) will be provided to guide you through these modules.

You will be introduced to core knowledge primarily through large class sessions, ranging in format from traditional lectures to more active learning sessions, where you are required to self-study assigned materials ahead of the session and build on that knowledge in subsequent reinforcement and guided problem-solving sessions.

You will also be expected to spend significant further time (approximately 3-4 hours for every timetabled contact hour) working independently and with peers, reviewing lecture notes, lecture video recordings, books, journal papers, e-learning materials and solving problem sets.

You will also work under the guidance and supervision of a member of the academic staff to complete your individual research project. 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.

Professional skills, such as technical report writing and presenting, are cultivated throughout the degree in various individual and group-based coursework.

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 College London, each ECTS credit taken equates to an expected total study time of 25 hours. Therefore, the expected total study time is 2,250 hours per year for an average student.

The Department expects you to allocate approximately 4 hours in self-study for every hour spent in lectures for a typical lecture-based module.

The pattern of work is greatly dependent on your selected elective modules, however on average you can expect to spend about 216 hours in lectures and tutorials with a further 909 hours, over the first two terms, being devoted to independent study. You will also be expected to spend 1,125 hours on self-directed research work for your Major Individual Research Project, spread out over all three terms (but full time from May onwards).

Assessment Strategy

Assessment Methods

The Department aims to employ assessment both to test your achievement of module objectives, referred to as summative assessment, and as a method of enhancing learning, developing skills and applying knowledge through assessment, referred to as formative assessment.

A variety of formative and summative assessment methods are utilised in this programme. Written examinations are utilised for modules where theoretical knowledge and its application within a disciplinary setting is introduced. In addition to a final summative assessment, such modules will typically offer opportunities for you and your instructors to assess your level of understanding and progress by completing in-class or online formative progress tests and tutorial classes.

Design and research projects are assessed through a variety of methods such as coursework in the form of:

- Project reports
- Research dissertation and practical such as:
- Oral presentations
- Viva voce

The exact balance of the summative assessment through the programme depends upon which elective modules are taken, but an indicative breakdown is:

Coursework	60%
Exams	30%
Oral Assessment	10%

To achieve a pass in a particular module, candidates must gain a weighted overall mark of 50% or greater.

Academic Feedback Policy

Feedback is an essential part of learning and the Department gives high priority to the timeliness and quality of feedback offered to you on all modules. The primary purpose of feedback is to assist learning and the development of skills, by highlighting strengths and weaknesses on one hand, and by identifying actions for improvement on the other. It is not meant to exclusively provide justification for assessment results. It is important to recognize that: 1) feedback comes in various forms and 2) feedback requires your active engagement.

Feedback will be provided for all assessments carried out as part of this programme. For examinations, a written examiner's report, commenting and providing quantitative information on the performance of the entire cohort, detailing common mistakes, and highlighting alternate approaches to the published solution, will be made available. For coursework, written feedback will normally be provided within three working weeks of submission. For the research dissertation, feedback will be provided ahead of the next opportunity where said feedback will be of use to you.

All modules will further aim to provide you with the opportunity to receive feedback ahead of any major summative assessment. Such feedback may be provided in the form of in-class progress tests, online self-assessment

exercises, tutorial sheets, etc. Where possible, as in the case of in-class tutorial sessions, oral examinations and poster sessions, oral feedback will be provided immediately by tutors or assessors.

You should keep in mind that not all feedback is structured, and important feedback may be obtained from self-reflection on your progress to date, from peers when studying or working together in a team, in dialogue with a lecturer or teacher in or outside of a tutorial, class or laboratory, or by email.

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

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 all core modules (Group A)
You need to choose five electives from Group B.

Code	Module Title	Core/ Compulsory/ Elective	Group	Term	Credits
AERO70020	Advanced Fluid Mechanics and Fluid Structure Interaction	Core	A	Autumn	5
AERO70008	Computational Fluid Dynamics	Core	A	Autumn	5
AERO70029	Computational Linear Algebra	Core	A	Autumn-Spring	5
AERO70024	Applications of Computational Fluid Dynamics	Core	A	Spring	5
AERO70034	Major Individual Research Project	Core	A	Autumn-Summer	45
AERO70011	High Performance Computing	Elective	B	Spring	5
AERO70004	Aeroelasticity	Elective	B	Autumn	5
AERO70005	Aerothermodynamics of Launchers and Re-Entry Vehicles	Elective	B	Autumn	5
AERO70026	Fundamentals of Scientific Machine Learning	Elective	B	Autumn	5
AERO70009	Computational Mechanics in Engineering (not running in 2025-26)	Elective	B	Spring	5
AERO70032	Flow Instability and Transition	Elective	B	Spring	5
AERO70010	Finite Elements	Elective	B	Autumn	5
AERO70012	Innovation Management	Elective	B	Autumn	5
AERO70013	Turbulence and Turbulence Modelling	Elective	B	Autumn	5
AERO70030	Control Theory for Flow Management (not running in 2025-26)	Elective	B	Spring	5
AERO70016	Orbital Mechanics	Elective	B	Spring	5
AERO70036	Systems Engineering for Unmanned Aerial Vehicles	Elective	B	Spring	5
AERO70039	Advanced Control	Elective	B	Autumn	5
AERO70040	Design Operations	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.

AERO70042	Quantification of Aerospace Environmental Impact	Elective	B	Autumn	5
				Credit Total	90

Progression and Classification

Classification of Postgraduate Taught Awards

Award of a PG Certificate
To qualify for the award of a postgraduate certificate you must have a minimum of 30 ECTS at Level 7 credits obtained only from the taught modules taken, i.e. excluding the Major Individual Research Project.

Award of a PG Diploma
To qualify for the award of a postgraduate diploma you must have a minimum of 60 ECTS credits at Level 7 and no more than 10 ECTS credits as a Compensated Pass.

Award of an Masters Degree
To qualify for the award of a postgraduate degree you must have:

- accumulated no fewer than 90 ECTS credits at Level 7;
- and no more than 10 ECTS credits as a Compensated Pass;
- met any specific requirements for an award as outlined in the approved programme specification for that 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: 50.0% 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, students on this MSc programme are subject to the standards set by the Engineering Council in relation to compensation. A maximum of 10 ECTS credits can be compensated across the programme.

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/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 a typical student may reasonably be expected to achieve and demonstrate if they 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.