Programme Information		
Programme Title	Programme Code	HECoS Code
Aeronautical Engineering with a Year in Industry	For Registry Use Only	For Registry Use Only

Award	Length of Study	Mode of Study	Entry Point(s)	Total Credits	
				ECTS	CATS
MEng	5 Years	Full-time	N/A *	300	600

* Students initially apply to the H401 Aeronautical Engineering programme and transfer at the end of their 3rd year.
** Students who withdraw before completing the MEng Aeronautical Engineering with a Year in Industry programme may, in exceptional circumstances and at the discretion of the Board of Examiners, be offered a BEng Ordinary Degree in Aeronautical Engineering (150 ECTS) as an exit award provided that they have met the ECTS requirements for that award in line with College Regulations. This award is an exit award only and not accredited by any professional body

Ownership			
Awarding Institution	Imperial College London	Faculty	Faculty of Engineering
Teaching Institution	Imperial College London	Department	Aeronautics
Associateship	City & Guilds Institute	Main Location(s) of Study	South Kensington Campus
External Reference			
Relevant QAA Benchmark Statement(s) and/or other external reference points		Honours Degrees in Engineering and Master's Degrees in Engineering	
FHEQ Level		7	
EHEA Level		2nd Cycle	
External Accreditor(s) (if applicable)			
External Accreditor 1:	Royal Aeronautical Society		
Accreditation received:	2015	Accreditation renewal:	2020
External Accreditor 2:	Institution of Mechanical Engineers		
Accreditation received:	2015	Accreditation renewal:	2020
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 Errikos Levis, Director of Undergraduate Studies
Student cohorts covered by specification	2019-20 entry
Date of introduction of programme	October 19
Date of programme specification/revision	January 19

Programme Overview

The Department of Aeronautics aims to provide a programme that trains and prepares the future leaders in aerospace and related engineering disciplines. This is done through an integrated programme of study wherein students engage with the constituent engineering disciplines in aerospace from the first week of the first year. We strongly believe that this is the most appropriate approach to train engineers of the highest quality in the 21st century, and as such the degree programme does not include a general engineering foundation.

As a graduate of our programme you who will not only be able to demonstrate technical and professional leadership skills in your field, but will also be adaptable and therefore well-suited to careers in both the industrial and service sectors. Additionally, you will be able to both demonstrate and apply your knowledge and skills to problems relevant to modern engineering practice in both general terms and in discipline-specific terms.

The key programme aims are:

- To provide you with a solid technical basis in all the key areas of the modern discipline-specific Engineering profession through delivery of a coherent, coordinated and balanced degree programme, integrating core engineering science with its application, both practically and computationally.
- To provide you with an appreciation of the conceptual and creative aspects of design; to develop the ability to incorporate concepts into the design of new products or processes and deal with an inherent level of uncertainty.
- To inculcate an understanding of professional behaviour, including your ability to communicate ideas and findings, plan and organise your work and work effectively within diverse teams.

Across the first three years of the degree you will develop a strong grounding in the three disciplinary pillars of aerospace engineering; aerodynamics, lightweight structures and structural mechanics, and flight mechanics and control. Each year, the relevant modules will build on your previous knowledge and skills, introducing increasingly advanced content, concentrating on both the underlying theory and its application. Applications in each disciplinary area will range from performing theoretical back-of-the-envelope calculations, to numerical computations (using commercial Computational Fluid Dynamics or Finite Element packages) and conducting experiments using the Department's wind tunnels, mechanical testing labs, and full-motion flight simulator. In addition to Departmental facilities, in the second year, you will have the opportunity to attend the National Flying Laboratory flight-testing course.

In each of the first three years of your studies, the interplay between disciplinary areas will be explored through multidisciplinary design-build-test exercises, where you will work within a team of your peers to devise creative, optimised solutions that meet customer specifications. As you progress through the programme, these tasks will become increasingly complex and open-ended, culminating in the third year Group Design Projects, where you will work as a member of a large design team, mirroring an industrial design office environment, to produce a complete vehicle or system design. In recent projects students have designed hybrid-electric regional airliners, reusable space payload delivery systems, electric racing vehicles or a submersible unmanned aerial vehicle.

In support of the above, in the first two years of your studies you will further follow classes to develop your competence in mathematics, computer programming and the use of computers for the implementation of numerical methods.

In the third and fifth years of your studies you will be able to tailor your studies to reflect your individual areas of interest within aerospace and related disciplines by selecting from wide collection of optional modules

alongside some core modules. The option to choose from a limited list of electives offered by other Engineering Departments is also available.

You will spend your fourth year on a 9 to 12-month, industrial placement relevant to your degree programme. To join the Year in Industry programme you will be expected to secure the placement during your third year of study. Through your placement you will be able to further develop your engineering practice by working in an industrial environment.

In the final year of your studies you will complete an individual research project in your chosen area of research, either working with one of the Department's specialist researchers and academics and their research group, or by undertaking an external project working with an internationally leading engineering company, typically at their site. External projects are assessed jointly by your industrial supervisor and academics from within the Department.

The department maintains very close contact with industry through a joint academic-industry advisory board, comprising of senior members from a wide variety of UK engineering companies that are influential in the aerospace sector and that constitute engineering career destinations for the student cohort (Airbus, ARA, BMT Fluid Mechanics Ltd, BAE Systems, QinetiQ, Rolls-Royce, Mercedes AMG F1, Jaguar Land Rover). You will have the opportunity to interact with industry through a number of talks and seminars, specific lectures, and projects. For example, visiting industrial speakers are invited each year to present either short lunch-time talks to all undergraduates on their experiences, or to contribute to one of the modules on offer, enriching the syllabus with their industrial perspective and experiences. These career talks are a significant resource in assisting you to identify opportunities for your Year in Industry.

Learning Outcomes

By the end of the five-year MEng programme you will have

1. a comprehensive knowledge and understanding of the scientific, mathematical, statistical, and computational principles, methods, and models relevant to the analysis of aeronautical engineering problems;

2. a comprehensive knowledge and understanding of the historical, current and developing (future) technologies, materials, equipment and processes in, and relevant to, the field of aeronautical engineering;

and will be able to

3. recognise the commercial, economic and social context of aeronautical engineering processes, the need for professional and ethical conduct in engineering management techniques, including project and change management, and the requirement to promote sustainable development;

4. apply and integrate fundamental knowledge to investigate new and emerging technologies in aeronautics and effectively communicate your findings;

5. identify, apply and integrate the knowledge necessary, in order to propose creative solutions to complex, interdisciplinary, open-ended problems in aerospace and related disciplines, effectively working with uncertainty;

6. identify and critically analyse aeronautical engineering processes, systems and components, using appropriate analytical, quantitative and computational methods, and modelling techniques;

7. plan and carry out experimental work, identifying the most appropriate approach and equipment, utilising relevant practical and laboratory skills, considering health, safety and risks.

8. develop a comprehensive knowledge and understanding of design processes, as well as their effective planning and management, in order to generate innovative designs;

9. work effectively within diverse, multicultural, interdisciplinary teams;

10. identify and evaluate business, customer and user needs, as well as key design constraints including legal, social, environmental, ethical and commercial requirements in an engineering context;

11. plan, monitor and improve upon a personal programme of work, 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.

12. demonstrate employability by developing a CV, securing an internship, and effectively working as part of a team, applying prior knowledge to day-to-day tasks within an industrial environment.

Prior to the completion of the complete programme of study, these learning outcomes will be achieved only partially, up to a level appropriate for the relevant exit degree level.

The Imperial Graduate Attributes are a set of core competencies which we expect students to achieve through completion of any Imperial College degree programme. The Graduate Attributes are available at: www.imperial.ac.uk/students/academic-support/graduate-attributes

Entry Requirements

Academic Requirement	Internal transfer only from the H401 programme at the end of the third year. Further information available at http://www.imperial.ac.uk/aeronautics/study/ug/current-students/programme-transfer/
Non-academic Requirements	None
English Language Requirement	-
Admissions Test/Interview	-

The programme's competency standards documents can be found at: https://www.imperial.ac.uk/media/imperial-college/faculty-of-engineering/aeronautics/Competency-Standards.pdf

Learning & Teaching Approach

Learning and Teaching Delivery Methods

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. The department will provide you with an iPad electronic note-taking and e-reading device, which will further be used to support learning through digital tools such as in-class Q&A sessions, visualisations and interactive lecture notes.

You will 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.

Each of the first three years of study features several laboratory exercises and design projects, carried out in small groups of 3-6 students. As you progress to higher years these exercises will become increasingly complex and less guided, moving from passive demonstrations to active learning exercises where you will explore possible options, consider constraints and develop your own knowledge, supported by the teaching staff and graduate teaching assistants. This culminates in the third year Group Design Project exercise, where you work in a team of approximately 20 students to complete a novel clean-sheet vehicle design to meet client specifications, and the fourth year where you will work under the guidance and supervision of a member of the teaching staff to complete your individual research project.

Professional skills, such as technical report writing and presenting, are cultivated in the first years of study through small group coaching and further developed in subsequent years through both individual and team-based coursework assignments. Drafting of engineering drawings using computational tools and computer programming are further taught in an active manner, through guided large class tutorial sessions, supported by the teaching staff and graduate teaching assistants.

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 1,500 hours per year for an average student.

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

- In the first two years of your studies (Level 4 & 5) you will spend 15% of your time in large class lectures and workshops (215 hours) with a further 7% of your time in small-class tutorials or lab practicals (105 hours).
- In the third year (Level 6), 15% of your total time will be spent in lectures, tutorials and lab practicals and 45% of your time in self-study supporting these modules. A further 40% of your time will be spent on team-based project work, involving self-study, project meetings, and collaborative work.
- The fourth year of your programme will be carried out on an industrial placement and your pattern of work will depend on the working practices of your placement provider, typically requiring 40 hour work week.
- In the fifth year (Level 7) the pattern of work is greatly dependent on your selected elective modules, however on average you can expect to spend about 125 hours in lectures and tutorials with a further 1350 hours, over three terms, being devoted to self-directed research work for your Individual Project.

Assessment Strategy

Assessment Methods

The Aeronautics 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.

Laboratory and design exercises are assessed through a variety of methods such as coursework in the form of:

- Progress reports
- Laboratory reports
- Individual and group project reports
- Engineering drawings
- Peer-assessment
- Computer programming submissions
- Research theses

and practicals such as:

- Oral presentations
- Poster presentations
- Oral examinations
- Laboratory skills assessments.

The breakdown of summative assessment for each year of the programme is indicated below.

	Year 1	Year 2	Year 3*	Year 4**	Year 5*
Coursework	20%	28%	37%	-	35%
Practical	9%	8%	21%	-	23%
Exams	71%	64%	42%	-	42%

* Note that figures for years 3 and 5 are approximate due to the varying assessment of elective modules
** The year in industry is assessed via quarterly reports of your progress, reviewed by your personal tutor.

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 recognise 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 minor pieces of coursework, written feedback will be provided within two working weeks of submission. For major, final, pieces of coursework, 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. The College'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
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/
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/

Additional Programme Costs		
Description	Mandatory/Optional	Approximate cost
National Flying Laboratory flight-testing course	Optional	£50
Insurance cover for provided tablet & accessories	Optional	£40 per annum
Students will need to consider the costs involved with placements. For students studying or working abroad as part of their programme, costs will vary with destination. Information on the types of costs which may be incurred can be found in the Placements Abroad Handbook which is available at https://www.imperial.ac.uk/placements/information-for-imperial-college-students/		

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 4 **Students study all core modules.**					
Code	Module Title	Core/ Elective	Group	Term	Credits
AERO4 0001	Aerodynamics 1	Core	N/A	1	7.5
AERO4 0008	Structures 1	Core	N/A	2	7.5
AERO4 0006	Mathematics 1	Core	N/A	1-2	7.5
AERO4 0007	Mechanics	Core	N/A	1	7.5
AERO4 0009	Thermodynamics and Heat Transfer	Core	N/A	2	5
AERO4 0005	Materials 1	Core	N/A	1	5
AERO4 0002	Introduction to Aerospace	Core	N/A	2	5
AERO4 0003	Computing and Numerical Methods 1	Core	N/A	1-2	5
AERO4 0004	Engineering Practice 1	Core	N/A	1-3	10
				Credit Total	60
Year 2 - FHEQ Level 5 **Students study all core modules.**					
Code	Module Title	Core/ Elective	Group	Term	Credits
	Aerodynamics 2	Core	N/A	1	7.5
	Structures 2	Core	N/A	1	7.5
	Mathematics 2	Core	N/A	1-2	7.5
	Mechatronics	Core	N/A	2	5
	Propulsion and Turbomachinery	Core	N/A	2	5
	Materials 2	Core	N/A	1	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.

	Flight Dynamics and Control	Core	N/A	2	5
	Computing and Numerical Methods 2	Core	N/A	1-2	5
	Engineering Practice 2 – Technical	Core	N/A	1-3	7.5
	Engineering Practice 2 – Project Development	Core	N/A	1	5
				Credit Total	60

Year 3 - FHEQ Level 6
Students study all core modules. Students must choose two optional modules and one from the list of available I-Explore modules. Elective choices/availability will be dependent on timetable constraints. Modules selected in Year 3, may not be chosen in Year 5. Please note that all electives are FHEQ Level 7.

Code	Module Title	Core/ Elective	Group	Term	Credits
	Aerodynamics 3	Core	N/A	1	7.5
	Structures 3	Core	N/A	1	7.5
	Control Systems	Core	N/A	2	5
	Aerospace Vehicle Design	Core	N/A	1-2	10
	Group Design Project	Core	N/A	3	15
	Finite Elements	Elective		1	5
	Orbital Mechanics	Elective		1	5
	Separated Flows and Fluid-Structure Interaction	Elective		2	5
	Mathematics 3	Elective		2	5
	Introduction to Turbulence and Turbulence Modelling	Elective		1	5
	Computational Fluid Dynamics	Elective		1	5
	Computational Mechanics	Elective		1	5
	Advanced Propulsion	Elective		2	5
	Innovation Management	Elective		1	5
	Advanced Manufacturing	Elective		1	5
	Hight Performance Computing	Elective		2	5
	Spacecraft Systems	Elective		2	5
	Spacecraft Structures	Elective		1	5
	Applications of Fluid Dynamics	Elective		1	5
	Applied Computational Aerodynamics	Elective		1	5
	Aerothermodynamics of Launchers and Re-Entry Vehicles	Elective		1	5
	Lightweight Structures	Elective		2	5

	Aeroelasticity	Elective		2	5
	I-Explore (Level 6)	Compulsory	N/A	1,2	5
				Credit Total	60

Year 4 - Placement

Code	Module Title	Core/ Elective	Group	Term	Credits
	Industrial Placement	Core	N/A	-	60
				Credit Total	60

Year 5 - FHEQ Level 7
Students study all core modules. Students must choose five optional modules. Elective choices/availability will be dependent on timetable constraints. Modules selected in Year 3, may not be chosen in Year 5.

Code	Module Title	Core/ Elective	Group	Term	Credits
	Individual Project	Core	N/A	1-3	35
	Finite Elements	Elective		1	5
	Orbital Mechanics	Elective		1	5
	Separated Flows and Fluid-Structure Interaction	Elective		2	5
	Mathematics 3	Elective		2	5
	Introduction to Turbulence and Turbulence Modelling	Elective		1	5
	Computational Fluid Dynamics	Elective		1	5
	Computational Mechanics	Elective		1	5
	Advanced Propulsion	Elective		2	5
	Innovation Management	Elective		1	5
	Advanced Manufacturing	Elective		1	5
	Hight Performance Computing	Elective		2	5
	Spacecraft Systems	Elective		2	5
	Spacecraft Structures	Elective		1	5
	Applications of Fluid Dynamics	Elective		1	5
	Applied Computational Aerodynamics	Elective		1	5
	Aerothermodynamics of Launchers and Re-Entry Vehicles	Elective		1	5
	Lightweight Structures	Elective		2	5
	Aeroelasticity	Elective		2	5
				Credit Total	60

Progression and Classification

Progression

In order to progress to the next level of study, you must have passed all modules (equivalent to 60 ECTS) in the current level of study at first attempt, at resit or by a compensated pass.

The overall weighted average for each year must be 40.00%, including where a module(s) has been compensated, in order for you to progress to the next year of the programme.

Classification

The marks from modules in each year contribute towards the final degree classification.

In order to be considered for an award, you must have achieved the minimum number of credits at the required levels prescribed for that award and met any programme specific requirements as set out in the Programme Specification.

Your classification will be determined through:

i) Aggregate Module marks for all modules
ii) Year Weightings

For this award, Year One is weighted at 7.50%, Year Two at 20.00%, and Years Three and Five at 36.25% each.

The College sets the class of undergraduate degree that may be awarded as follows:

i)	First	70.00% or above for the average weighted module results
ii)	Upper Second	60.00% or above for the average weighted module results
iii)	Lower Second	50.00% or above for the average weighted module results
iv)	Third	40.00% or above for the average weighted module results

Please find the full Academic Regulations at https://www.imperial.ac.uk/about/governance/academic-governance/regulations/. Please follow the prompts to find the set of regulations relevant to your programme of study.

Programme Specific Regulations

As an accredited degree, students on this programme are subject to the standards set by the Engineering Council in relation to compensation: a maximum of 15 ECTS credits can be compensated across the entire programme.

Supporting Information
The Programme Handbook is available at: TBD
The Module Handbook is available at: TBD
The College's entry requirements for postgraduate programmes can be found at: www.imperial.ac.uk/study/pg/apply/requirements
The College's Quality & Enhancement Framework is available at: 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
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/
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 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.

Modifications			
Description	**Approved**	**Date**	**Paper Reference**
N/A	N/A	N/A	N/A