

Programme Information		
Programme Title	Programme Code	HECoS Code
MSc Composites: The Science, Technology and Engineering Application of Advanced Composites	J5U1	For Registry Use Only

Award	Length of Study	Mode of Study	Entry Point(s)	Total Credits	
				ECTS	CATS
MSc	12 months	Full-time	Annually in October	90	180
PG Diploma	N/A	Full-time	N/A	60	120
PG Certificate	N/A	Full-time	N/A	30	60

The PG Certificate and PG Diploma are exit awards and are not available for entry. All students 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	N/A	Main Location(s) of Study	South Kensington Campus

External Reference	
Relevant QAA Benchmark Statement(s) and/or other external reference points	Master's award in Engineering
FHEQ Level	7
EHEA Level	2nd Cycle

External Accrator(s) (if applicable)			
External Accrator 1:	Institute of Materials, Mineral and Mining		
Accreditation received:	2020	Accreditation renewal:	2025
External Accrator 2:	Institute of Mechanical Engineers		
Accreditation received:	2020	Accreditation renewal:	2025
External Accrator 3:	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		Dr Koon-Yang Lee	
Student cohorts covered by specification		2022-23 entry	
Date of introduction of programme		October 21	
Date of programme specification/revision		October 22	

Programme Overview
<p>Advanced composite materials are a vital material technology that also offer operational savings and extended service lifetimes due to their high strength-to-weight and high stiffness-to-weight ratios. It is used extensively in the aerospace, automotive, marine and wind turbine industries. Growing public demand for more environmentally friendly materials has also sparked the development of bio-based composite materials as a sustainable alternative to fossil-derived materials.</p> <p>This MSc course aims to provide a broad education in all aspects of composite science and technology for students coming from a wide range of backgrounds in science and engineering. The emphasis given throughout the course is to set composite materials in context against other materials and, hence, to show the circumstances under which they might best be used by all sectors of industry. In addition to mechanical performance, attention is given to costs, ease of fabrication, durability, and other factors which impinge on creating viable industrial products.</p> <p>This programme provides a high quality, broad-based education on both the theory and practice of the science and technology of composite materials, delivered by experts in their field, who are also committed teachers, communicators and researchers. There is an emphasis on group working and presentational skills throughout the programme. Specialisation is allowed for via research project work. The programme is offered on a full-time one-year basis and leads to the MSc degree. The programme is composed of core and elective modules that are taught across the first two terms (October-December, January-March), as described in the programme structure below. You will also undertake a comprehensive laboratory programme in the Autumn term and a Group Design project in the Spring term. From May onwards, your time is devoted to the individual research project.</p>
Learning Outcomes
<p>By the end of the MSc programme, you will be able to:</p> <ol style="list-style-type: none"> 1. Apply the comprehensive knowledge and understanding of the scientific, mathematical and computational principles, methods and models relevant to the analysis of composite materials; 2. Evaluate the current and developing (future) technologies, materials, equipment and processes in, and relevant to, the field of composite science and technology; 3. Recognise the commercial, economic and social context of composite materials, 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 composite science and technology, and effectively communicate your findings; 5. Identify, apply and integrate the knowledge necessary, in order to propose creative solutions to complex, interdisciplinary, open-ended and ill-defined problems in composite science and technology, as well as any related disciplines, effectively working with uncertainty; 6. Plan and carry out experimental work, identifying the most appropriate approach and equipment, utilising relevant practical and laboratory skills, considering health, safety and risks.

7. Develop a comprehensive knowledge and understanding of composite design processes, as well as their effective planning and management, in order to generate innovative designs;
8. Work effectively within diverse, multicultural, interdisciplinary teams;
9. 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;
10. 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.

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

- Apply the comprehensive knowledge and understanding of the scientific, mathematical and computational principles, methods and models relevant to the analysis of composite materials;
- Evaluate the current and developing (future) technologies, materials, equipment and processes in, and relevant to, the field of composite science and technology.

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 within diverse, multicultural, interdisciplinary teams.

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	Minimum 2.1 UK Bachelor's Degree or equivalent in general engineering, aeronautical/aerospace engineering, mechanical engineering, civil engineering, chemical engineering, materials science, materials engineering, physics or chemistry.
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	Shortlisted applicants may be invited to an online interview with a member of staff. In the interview, the applicant may be asked to discuss the motivation of applying to this programme, the applicant's career aspiration, the content of a relevant scientific article and/or the applicant's research experience.

The programme's competency standards documents can be found at: TBA

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 Finite Elements Analysis
- Introductory Mathematics
- Introduction to Programming
- 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 used 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. This programme features several laboratory exercises and one design project, carried out in small groups of 3-6 students. Both of these are designed to encourage active learning, where you will explore possible options, consider constraints and develop your own knowledge, supported by the teaching staff and graduate teaching assistants. You will also work under the guidance and supervision of a member of the academic staff to complete your individual research project. 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, 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. 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 Department aims to employ assessment both to test your achievement of module learning outcomes, 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 exercises, design and research projects are assessed through a variety of methods such as coursework in the form of:

- Individual and group project reports
- Peer-assessment
- 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	43.89%
Exams	29.44%
Practical	26.67%

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 minor pieces of coursework, such as a laboratory report, written feedback will be provided normally within two working weeks of submission. For major pieces of coursework, such as research dissertation and group design project, 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

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 Students study all core modules. Students need to choose two electives from Group B					
Code	Module Title	Core/ Compulsory/ Elective	Group	Term	Credits
AERO70033	Fundamentals of Composite Materials	Core	A	1	5
AERO70002	Advanced Manufacturing	Core	A	1	5
AERO70014	Lightweight Structures	Core	A	1	5
AERO70023	Analytical Characterisation of Composite Materials	Core	A	2	5
AERO70027	Composite Engineering Practice	Core	A	1-3	15
AERO70034	Major Individual Research Project	Core	A	1-3	45
AERO70010	Finite Elements	Elective	B	1	5
AERO70012	Innovation Management	Elective	B	1	5
AERO70035	Structural Integrity and Health Monitoring	Elective	B	1-2	5
AERO70009	Computational Mechanics	Elective	B	2	5
AERO70028	Composite innovation - Nanocomposites and Structural Power	Elective	B	2	5
Credit Total					90

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.

Classification of Postgraduate Taught Awards

Award of a PG Certificate

To qualify for the award of a postgraduate certificate a student 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 a student must have a minimum of 60 ECTS credits at Level 7.

Award of an MSc Degree

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

- Accumulated no fewer than 90 ECTS credits at Level 7 of which no more than 10 ECTS credits may be from a Compensated Pass
- Met any specific requirements for an award as outlined in the approved programme specification for that award

For MSc programmes in the Department of Aeronautics, the class of the Degree may be awarded as follows:

- Distinction: The student has achieved a mark of 70.0% or greater for their taught modules' assessment aggregate AND a mark of 70.0% or greater for their project.
- Merit: The student has achieved a mark of 60.0% or greater for their taught modules' assessment aggregate AND a mark of 60.0% or greater for their project but either the taught modules' assessment aggregate or the project mark or both are below 70.0%
- Pass: The student has achieved a mark of 50.0% or greater for their taught modules' assessment aggregate AND a mark of 50.0% or greater for their project but either the taught modules' assessment aggregate or the project mark or both are below 60.0%

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 at: TBA
The Module Handbook is available at: TBA
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
Curriculum Review	Programmes Committee	30/03/21	PC.2020.24b