

## Template C4



# Programme Specification

**Title of Course:** *MEng Aerospace Engineering*

<b>Date first produced</b>	01/03/2018
<b>Date last revised</b>	19/09/2024
<b>Date of implementation of current version</b>	01/09/2024
<b>Version number</b>	8
<b>Faculty</b>	Faculty of Engineering, Computing and the Environment
<b>School</b>	School of Engineering
<b>Department</b>	Department of Aerospace and Aircraft Engineering
<b>Delivery Institution</b>	Kingston University

This Programme Specification is designed for prospective students, current students, academic staff and employers. It provides a concise summary of the main features of the programme and the intended learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if they take full advantage of the learning opportunities that are provided. More detailed information on the learning outcomes and content of each modules can be found in the course VLE site and in individual Module Descriptors.

## SECTION 1: GENERAL INFORMATION

<b>Award(s) and Title(s):</b> <i>Up to 10 pathways</i>	MEng Aerospace Engineering
<b>Intermediate Awards(s) and Title(s):</b> <i>There are 4 Intermediate awards for each pathway</i>	Cert HE in Aerospace Engineering Dip HE in Aerospace Engineering BEng Aerospace Engineering BEng (Hons) Aerospace Engineering (Space Technology)
<b>Course Code</b> <i>For each pathway and mode of delivery</i>	UFAEE1AEE01
<b>UCAS code</b> <i>For each pathway</i>	H425

<b>Award(s) and Title(s):</b> <i>Up to 10 pathways</i>	MEng Aerospace Engineering (Space Technology)
<b>Intermediate Awards(s) and Title(s):</b> <i>There are 4 Intermediate awards for each pathway</i>	Cert HE in Aerospace Engineering Dip HE in Aerospace Engineering BEng Aerospace Engineering BEng (Hons) Aerospace Engineering (Space Technology)
<b>Course Code</b> <i>For each pathway and mode of delivery</i>	UFAST1AST80
<b>UCAS code</b> <i>For each pathway</i>	

<b>RQF Level for the Final Award:</b>	Level 7
<b>Awarding Institution:</b>	Kingston University
<b>Teaching Institution:</b>	Kingston University
<b>Location:</b>	Roehampton Vale Campus, Kingston
<b>Language of Delivery:</b>	English
<b>Modes of Delivery:</b>	Full-time
<b>Available as:</b>	Full field
<b>Minimum period of registration:</b>	Full-time - FT: 4 years
<b>Maximum period of registration:</b>	Full-time - FT: 8 years
<b>Entry Requirements:</b>	The minimum entry qualifications for the programme are: From A levels: 72 (including A2 in Maths and Science)

	<p>BTEC National: Distinction in Further Maths and Further Mechanical Principles</p> <p>A minimum IELTS score of 6.5 or equivalent is required for those for whom English is not their first language.</p> <p>Entry is normally at Level 4 with A-level or equivalent qualifications (See section D). Transfer from a similar course is possible at Level 5 with passes in comparable Level 4 modules – but is at the discretion of the course team. Intake is normally in September.</p>
<b>Programme Accredited by:</b>	Royal Aeronautical Society (RAeS)
<b>QAA Subject Benchmark Statements:</b>	Engineering
<b>Approved Variants:</b>	None
<b>Is this Higher or Degree Apprenticeship course?</b>	

***For Higher or Degree Apprenticeship proposals only***

<b>Higher or Degree Apprenticeship standard:</b>	n/a
<b>Recruitment, Selection and Admission process:</b>	n/a
<b>End Point Assessment Organisation(s):</b>	n/a

## **SECTION 2: THE COURSE**

### **A. Aims of the Course**

The general aims of the course are:

- To equip graduates with the engineering, design, management, business, and personal skills required to become professional aerospace engineers, as well as enabling them to follow careers in related professional disciplines.
- To meet the academic requirements fully for Incorporated membership as well as (when combined with approved further learning) for Chartered Membership of the Royal Aeronautical Society (RAes) by ensuring that the course is accredited by that body.

More specific aims of the course are:

- To produce graduates with a breadth and depth of knowledge and a thorough comprehension of the key aspects of aerospace engineering.
- To allow students to develop analytical and problem-solving skills and an ability to evaluate evidence and assumptions to reach sound judgements and communicate these effectively.
- To provide graduates to industry who have a creative approach to the solution of design problems and the requisite technical skills to realise these solutions.
- To equip students with the research skills required for postgraduate study and the employability skills required for work in the aerospace and related engineering industries.
- To furnish graduates with a firm grasp of sustainability and 'Health and Safety within the context of their discipline.
- To provide graduates who have the reflective skills to recognise the need to continually develop themselves to exercise their Professional judgement.

### **B. Intended Learning Outcomes**

The course outcomes are referenced to the relevant QAA subject benchmarks indicated and the Frameworks for Higher Education Qualifications of UK Degree-Awarding Bodies (2014) And relate to the typical student. The course provides opportunities for students to develop and demonstrate knowledge and understanding specific to the subject, key skills, and graduate attributes in the following areas:

The programme learning outcomes are the high-level learning outcomes that will have been achieved by all students receiving this award. They must align to the levels set out in the [‘Sector Recognised Standards in England’](#) (OFS 2022).

Programme Learning Outcomes					
	Knowledge and Understanding		Intellectual Skills		Subject Practical Skills
	On completion of the course students will be able to:		On completion of the course students will be able to		On completion of the course students will be able to
A6	Demonstrate understanding of generating new knowledge and methods using research and development skills.	B6	Recognise the importance of professional bodies and the professional conduct expected of Chartered Engineers	C6	Comply with Health and Safety regulations within the work place and as they apply to aerospace design
A5	Demonstrate understanding of the economical, ethical and sustainability challenges facing aerospace industry.	B5	Demonstrate a positive attitude to learning that encourages continuing professional development throughout their careers	C5	Work independently or as part of a team to initiate, Lead to investigate, plan, manage and drive projects to a successful conclusion and produce the associated documentation.
A4	Apply business methods to assess the economic and financial aspects of aerospace engineering projects and management.	B1	Recognise, evaluate and analyse problems; identify and investigate possible solutions and make sound decisions regarding the solution to adopt and/or the course of action to be taken.	C4	Use a range of engineering and IT equipment and software to assist with information retrieval, management and problem solving.
A2	Demonstrate a knowledge and understanding of aerospace vehicle engineering design and development.	B3	Communicate clearly and succinctly orally, graphically and in writing having due regard for the receiving audience and intellectual property rights.	C3	Use a range of technical equipment and instruments, gaining an understanding of their underlying technology and their application in aerospace industry.
A1	Demonstrate and apply their knowledge and understanding of essential facts, concepts, theories and principles associated with aerospace engineering and underpinning mathematics and science.	B2	Locate, collect, collate, interpret and critically evaluate arguments, assumptions, abstract concepts and data (that may be incomplete), and use it to make judgements, and to frame appropriate questions to help achieve a solution.	C2	Use engineering workshop and laboratory equipment safely for manufacture and experimental investigation

A3	Demonstrate a clear understanding of the legal obligations pertaining to aerospace engineers, the rules and regulations under which they must work and the importance of Health and Safety in the engineering industry.	B4	Undertake leadership roles and manage projects, people, resources and time, taking account of legal and statutory requirements, risk, safety, quality and reliability.	C1	Apply aerospace engineering principles and undertake practical work and analyse the data obtained for use in design and development.
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In addition to the programme learning outcomes, the programme of study defined in this programme specification will allow students to develop the following range of Graduate Attributes:

1. Creative Problem Solving
2. Digital Competency
3. Enterprise
4. Questioning Mindset
5. Adaptability
6. Empathy
7. Collaboration
8. Resilience
9. Self-Awareness

### C. Outline Programme Structure

This programme is offered in full-time and sandwich modes. The sandwich year is taken between level 6 and level 7. Intake is in September.

#### MEng Aerospace Engineering

<b>Level 4</b>							
<b>MEng Aerospace Engineering</b>							
<b>Core modules</b>	<b>Module code</b>	<b>Credit Value</b>	<b>Level</b>	<b>Teaching Block</b>	<b>Pre-requisites</b>	<b>Full Time</b>	<b>Part Time</b>
Engineering Design and Manufacture	EG4023	30	4	TY13		1	
Engineering Mathematics	EG4017	15	4	TB1		1	
Engineering Mechanics and Materials	EG4019	30	4	TY13		1	
Introduction to Aerospace Engineering	AE4007	15	4	2	None	1	
Navigate for the Professional Engineer	AE4021	15	4	1	None	1	
Thermodynamics and Fluid Mechanics	EG4024	15	4	TB2		1	
<b>Optional Modules</b>							

#### Progression to Level 5

This course permits progression from level 4 to level 5 with 90 credits at level 4 or above. The outstanding 30 credits from level 4 can be trailed into level 5 and must be passed before progression

to level 6. Students exiting the course at this point who have successfully completed 120 credits at level 4 or above are eligible for the award of Certificate of Higher Education. Progression to level 5 requires passes in all four modules to give 120 credits at level 4.

<b>Level 5</b>							
<b>MEng Aerospace Engineering</b>							
<b>Core modules</b>	<b>Module code</b>	<b>Credit Value</b>	<b>Level</b>	<b>Teaching Block</b>	<b>Pre-requisites</b>	<b>Full Time</b>	<b>Part Time</b>
Aerodynamics and Propulsion	AE5023	15	5	1	None	2	
Aerospace Electronic and Control Systems	AE5042	30	5	1 and 2	None	2	
Aerospace Structures, Materials and Vibrations	AE5034	30	5	1 and 2	None	2	
Aircraft Performance and Design	AE5031	15	5	2	None	2	
Computer Aided Aerospace Engineering Design	AE5027	15	5	2	None	2	
Exploring Engineering Project Management	EG5016	15	5	TB1		2	
<b>Optional Modules</b>							

### Progression to Level 6

Progression to level 6 requires passes in all four modules to give 120 credits at level 5. This course permits progression from level 5 to level 6 with 90 credits at level 5 or above. The outstanding 30 credits from level 5 can be trailed into level 6 and must be passed before consideration for an award or progression to level 7. Students exiting the programme at this point who have successfully completed 120 credits at level 5 or above are eligible for the award of Diploma of Higher Education.

<b>Level 6</b>							
<b>MEng Aerospace Engineering</b>							
<b>Core modules</b>	<b>Module code</b>	<b>Credit Value</b>	<b>Level</b>	<b>Teaching Block</b>	<b>Pre-requisites</b>	<b>Full Time</b>	<b>Part Time</b>
Aircraft Design Project	AUG-26-06835	15	6	1	none	3	
Applied Business Management	EG6026	15	6	TB1		1	
Flight Dynamics and Propulsion	AUG-26-06834	30	6	1 and 2	None	3	
Further Aerodynamics	AUG-26-06771	15	6	1	None	3	



Further Aerospace Structures	AUG-26-06772	15	6	2	None	3	
Individual Project	EG6018	30	6	1 and 2	None	3	
<b>Optional Modules</b>							

Level 6 requires the completion of

Level 6 requires the completion of the compulsory modules and \*\* option modules. For integrated masters courses only (delete if not applicable): This course permits progression from level 6 to level 7 with 90 credits at level 6 or above. The outstanding 30 credits from level 6 can be trailed into level 7 and must be passed before consideration for an award.

<b>Level 7</b>							
<b>MEng Aerospace Engineering</b>							
<b>Core modules</b>	<b>Module code</b>	<b>Credit Value</b>	<b>Level</b>	<b>Teaching Block</b>	<b>Pre-requisites</b>	<b>Full Time</b>	<b>Part Time</b>
Advanced CAD/CAM Systems	AE7761	15	7	1	None	4	
Advanced Computational Fluid Dynamics	EG7704	15	7	1	None	4	
Advanced Engineering Materials	EG7703	15	7	2	None	4	
Advanced Structural Analysis	EG7705	15	7	1	None	4	
Group Design Project	EG7001	30	7	1 and 2	None	4	
Space Mission Analysis and Design	AE7030	30	7	1 and 2	None	4	
<b>Optional Modules</b>							

Level 7 information

Students exiting the programme with 60 level 7 credits are eligible for the award of PgCert in Aerospace Engineering (Space Technology). Students exiting the programme with 120 level 7 credits are eligible for the award of PgDip in Aerospace Engineering (Space Technology).

### MEng Aerospace Engineering (Space Technology)

<b>Level 4</b>							
<b>MEng Aerospace Engineering (Space Technology)</b>							
<b>Core modules</b>	<b>Module code</b>	<b>Credit Value</b>	<b>Level</b>	<b>Teaching Block</b>	<b>Pre-requisites</b>	<b>Full Time</b>	<b>Part Time</b>
Engineering Mathematics	EG4017	15	4	TB1		1	

Engineering Mechanics and Materials	EG4019	30	4	TY13		1	
Introduction to Astronautics	AE4008	15	4	1	None	1	
Navigate for the Professional Engineer	AE4021	15	4	1	None	1	
Thermodynamics and Fluid Mechanics	EG4024	15	4	TB2		1	
Thermodynamics and Fluid Mechanics	EG4024	15	4	TB2		1	
<b>Optional Modules</b>							

### Progression to Level 5

This course permits progression from level 4 to level 5 with 90 credits at level 4 or above. The outstanding 30 credits from level 4 can be trailed into level 5 and must be passed before progression to level 6. Students exiting the course at this point who have successfully completed 120 credits at level 4 or above are eligible for the award of Certificate of Higher Education. Progression to level 5 requires passes in all four modules to give 120 credits at level 4.

<b>Level 5</b>							
<b>MEng Aerospace Engineering (Space Technology)</b>							
<b>Core modules</b>	<b>Module code</b>	<b>Credit Value</b>	<b>Level</b>	<b>Teaching Block</b>	<b>Pre-requisites</b>	<b>Full Time</b>	<b>Part Time</b>
Aerodynamics and Propulsion	AE5023	15	5	1	None	2	
Aerospace Electronic and Control Systems	AE5042	30	5	1 and 2	None	2	
Aerospace Structures, Materials and Vibrations	AE5034	30	5	1 and 2	None	2	
Computer Aided Aerospace Engineering Design	AE5027	15	5	2	None	2	
Exploring Engineering Project Management	EG5016	15	5	TB1		2	
Space Technology Design	AE5028	15	5	2	None	2	
<b>Optional Modules</b>							

<b>Level 6</b>							
<b>MEng Aerospace Engineering (Space Technology)</b>							
<b>Core modules</b>	<b>Module code</b>	<b>Credit Value</b>	<b>Level</b>	<b>Teaching Block</b>	<b>Pre-requisites</b>	<b>Full Time</b>	<b>Part Time</b>

Applied Business Management	EG6026	15	6	TB1		3	
Further Aerodynamics	AUG-26-06771	15	6	1	None	3	
Further Aerospace Structures	AUG-26-06772	15	6	2	None	3	
Further Space Vehicle Engineering	AUG-26-06773	30	6	1 and 2	None	3	
Individual Project	EG6018	30	6	TY13		3	
Space Technology Design Project	Aug-26-09774	15	6	2	None	3	
<b>Optional Modules</b>							

Level 6 requires the completion of

Students exiting the programme at this point who have successfully complete 60 credits at level 6 under the University's Undergraduate Regulations (UR) are eligible for the award of BEng (ordinary) Degree

Students exiting the programme at this point who have successfully completed 120 credits under the University's Undergraduate Regulations (UR) are eligible for the award of Bachelor of Engineering (Hons) Degree

<b>Level 7</b>							
<b>MEng Aerospace Engineering (Space Technology)</b>							
<b>Core modules</b>	<b>Module code</b>	<b>Credit Value</b>	<b>Level</b>	<b>Teaching Block</b>	<b>Pre-requisites</b>	<b>Full Time</b>	<b>Part Time</b>
Advanced CAD/CAM Systems	AE7761	15	7	1	none	4	
Advanced Computational Fluid Dynamics	EG7704	15	7	1	None	4	
Advanced Engineering Materials	EG7703	15	7	1/2	None	4	
Advanced Structural Analysis	EG7705	15	7	1/2	None	4	
Group Design Project	EG7001	30	7	1/2	none	4	
Space Mission Analysis and Design	AE7030	30	7	1 and 2	none	4	
<b>Optional Modules</b>							

#### **D. Principles of Teaching, Learning and Assessment**

The MEng course in Aerospace Engineering has been designed, considering the Kingston University Curriculum Design Principles, to help develop students into graduates that are professional, thoughtful, creative, resilient, proactive, and globally aware and independent, equipping them to be lifelong learners.

#### Development of Independent learning through the course

The learning, teaching and assessment strategy of the course is aimed at supporting progression in curriculum content and skills development through the levels of study. At level 4 there is a clear structure and guidance for students' learning with an emphasis on the acquisition of fundamental engineering knowledge, graduate attributes, and key skills (e.g., Mathematics and IT in EG4017 Engineering Mathematics, practical skills Engineering Design and Manufacturing (EG4023), and the initial development of Future Skills in AE4021 Navigate. This provides a solid foundation for students to undertake a deeper study in a specific engineering discipline at level 5. At level 5 there will be an increased expectation of independent study, supported by a reduced emphasis on the use of traditional lectures. Students will continue to receive clear guidance on how to assess their understanding of the material through self-assessment questions and at scheduled tutorials.

At level 6, students will be expected to take greater ownership of their independent study with academics taking on more of a supervisory role. This is exemplified in the individual and group project modules Aerospace/Space Technology Group Design and Individual project and the modules AE6020 Further Aerodynamics, where students undertake self-paced computer workshops for CFD and flipped classroom tutorials to present solutions to complex analysis problems.

Module guides set out clear expectations for guided independent learning. Students will be directed to reading and Technology Enhanced Learning (TEL) packages to prepare for individual topics, or sessions and to structured problem sets to consolidate and test their learning afterwards. This will be introduced at level 4 and further developed at subsequent levels. The Personal Tutor Scheme at level 4 will develop skills in reflection on learning and finding additional support if required. The Virtual Learning Environment (VLE) Canvas at Kingston will support learning throughout the course through a variety of TEL objects such as videos, screencasts, online MCQs, discussion boards and interactive teaching packages. It will also deliver teaching material such as lecture notes/presentations, problems set and worked examples. This helps support an inclusive approach as students can access learning material at their convenience and work through it at their own pace with the opportunity to pause and rewind as they wish.

#### Integrated first-year and interdisciplinary collaboration

All engineering students at Kingston University take a common set of six modules. This allows all students to experience various engineering disciplines before having to commit to their chosen area of specialisation. The opportunity to study and work with students from different branches of engineering is a distinct feature of the course at Kingston and is extended into the second year when all students take a common level 5 module. In EG4023 Engineering Design and Manufacturing students will be introduced to the principles and importance of group work. Project-based learning (PjBL) is employed requiring interdisciplinary teams to design, build and present solutions to small scale engineering challenges, the outputs of these will be part of the summative assessment. Interdisciplinary group work will be further developed at level 5 in EG5016 Exploring Engineering Project Management where students are taught about group project management in TB1 and then will spend much of TB2 working on a more complex challenge. In this module students are likely to tackle a live, real-world problem supplied by a well know company or organization. This will give the students an opportunity to talk about how they have worked with an external company on an engineering problem as part of a team when they apply for an

industrial placement. At level 6, students will consolidate their group working skills Applied Business Management and Aircraft/Space Technology Design Project when undertaking a group design project in their own engineering discipline, using the team working skills learned in earlier years. For example, the Bright Ideas competition is embedded in Apply and Business Management Module that students work in teams to develop an innovative idea for a business case.

#### Focus on active learning and enhancing student engagement

A feature of the learning, teaching and assessment strategy in the School of Engineering is that many instructional lectures have been replaced by collaborative, problem-solving or enquiry-based learning workshops and tutorials. These require students to prepare for, and participate in, the classroom activities, rather than passively listening to the lecturer. Students are expected to engage with the guided learning to prepare for these teaching sessions and consolidate their learning after the session. These interactive sessions also provide students with opportunities for peer learning, group work and presentation practice. In these sessions, the lecturer facilitates learning by supporting students in creating their own knowledge and understanding. Lecturers may also introduce and summarize key concepts with short mini lectures.

Project-based Learning (PBJL) is introduced in EG4023 Engineering Design and Manufacturing and developed further in Introduction to Space Vehicle Design, EG5016 Exploring Engineering Project Management, Aircraft Design and EG6026 Apply. These collaborative activities encourage students to draw on their own set of experiences and cultural backgrounds when tackling real-world challenges. The Flipped classroom approach is introduced across the two-engineering science-based modules (EG4019 Engineering Mechanics, Structure and Materials, EG4024 Thermodynamics and Fluid Mechanics) and Engineering Mathematics EG4017. Here the curriculum (lecture content) of a small topic is delivered via online materials (screencasts, videos, or study packs) and then developed and applied in workshops. At level 5, Aerodynamics and Propulsion has a more substantial Flipped classroom approach where roughly one-third of the curriculum is taught by this method and this approach is continued in Further Aerodynamics, Further Aerospace Structures, Further Vehicle Engineering, Space Mission Analysis and Design,

Active and collaborative learning is also incorporated in traditional lectures, which may have question-and-answer sessions, brief student discussions, and Canvas quiz activities integrated into the lectures. These methods ensure that valuable contact time is focussed on the application and critical analysis of knowledge and the development of key skills such as problem-solving, communication, and group work. The high percentage use of active learning sessions in the teaching hours is aimed at improving student engagement, creativity, confidence, and self-reliance. The course endeavours to further secure student engagement by making students feel part of a community and increasing their sense of belonging, which supports improved retention and progression. This is achieved by providing opportunities to interact with staff and students both socially and academically. In addition, to the active learning sessions and group work, this is achieved through: the PT scheme, fieldwork, industrial visits, extra-curricular seminars, research internships, course representative system, student ambassador work, peer mentoring, PAL civic engagement and outreach opportunities.

## Development of employability skills

To complement the development of employability skills within the curriculum, personal tutors will encourage students to engage in a range of extra-curricular activities such as student representation, part-time work, sports and recreation, society membership, volunteering; student ambassadorship, leadership, and mentoring; cultural and creative activities; academic and professional collaboration; placement activity; enterprise activity; career events and opportunities. Activity in these areas is recognised by the university's Kingston Award Scheme. KU Talent offers a range of events, including Careers fairs, which include employers coming to campus to promote internship, placement and graduate opportunities, Spotlight on engineering networking activities where employers and alumni are invited on campus to talk about career pathways.

Engineering is fundamentally a creative industry and innovation is embedded throughout the curriculum, primarily through interdisciplinary and group project work. This starts in level 4 with AE4021 Navigate for the Professional Engineer and is further developed in Aerospace Design. In EG6026, a major group project is embedded within the Applied Business Management module. This encourages students to consider the broader business context in their project work. In addition, this module gives students the opportunity to compete in the annual Bright Ideas competition, which is a university-wide competition to encourage entrepreneurship. EG6026 Applied Business Management enables students to develop their self-reflection, personal development plan, team-working, interpersonal and interdisciplinary skills, communication and presentation, time management and organisational skills.

To complement the development of employability skills within the curriculum, personal tutors will encourage students to engage in a range of extra-curricular activities such as student representation, part-time work, sports and recreation, society membership, volunteering; student ambassadorship, leadership, and mentoring; cultural and creative activities; academic and professional collaboration; placement activity; enterprise activity; career events and opportunities. Activity in these areas is recognised by the University's Kingston Award Scheme. KU Talent offers a range of events, including Careers fairs, which include employers coming to campus to promote internship, placement and graduate opportunities, Spotlight on engineering networking activities where employers and alumni are invited on campus to talk about career pathways.

## Hands-on Practical work

Hands-on practical experience in workshops and laboratories is fundamental in developing practical skills as well as enhancing data collection and analysis skills. Students will have the opportunity to work in laboratories and workshops in most of their modules. Practical work is closely related to the taught content to provide context for the theoretical work. At level 4 students are introduced to basic measurement and manufacturing processes and how to apply these in a laboratory and testing environment (EG4019 Engineering Mechanics, Structures and Materials). At level 5 the focus is on more sophisticated measurement techniques and interpretation (Aerospace Structures, Materials and Vibrations, Aerodynamics and Propulsion). This is delivered through supervised practical sessions with experiment protocols. At level 6, students are expected to select and apply requisite practical skills in their independent research work in Individual Project module. Their project often involves lab-based experiments using workshops, 3D printers, wind tunnels, structure and material testing equipment and the rocket lab. InFlight Dynamics and Propulsion, students will gain practical experience in flight testing in the annual field trips at the National Flying Laboratory.

## Research Informed Teaching

Most of the course team are either engineering research active or are involved in industry-related professional activities, through KTPs or other direct involvement with industry. These activities played a major part in informing the course design and content, as did the direct input from the industry through the activities of the Industrial Advisory Board. Most of the teaching staff are also actively involved in the Faculty Research Groups, or maybe following their own interest areas. These activities take them into, amongst other areas, advanced structures and materials research, computational fluid dynamics research, dynamics, and control research and on through sustainable power generation to electric vehicle technology with the success of the zero-emissions electric motorbike. The modules at levels 6 and 7 are mainly taught and managed by academic staff who are engaged in research in various areas. They include their research findings in addition to well-established principles, for example in the modules Further Aerodynamics and Further Aerospace Structures, the areas such as computational fluid dynamics and aerospace structures. In the module Further Space Vehicle Design the research in space vehicle design is discussed, keeping updated with the latest advancement in international space missions.

Students are encouraged to develop their own research skills, which are a fundamental part of the curriculum throughout all levels of the programme. They are often encouraged, through project work, to work with active research staff on elements of live projects, and these research skills enable students to determine, distinguish and present appropriate evidence in an argument, which is of great value to employers. Academic staff are also engaged widely with the research and development of ideas in teaching and learning in Higher Education and into wider pedagogic issues which will then feed through to support learning in lectures and other forms of student engagement the programme, both formal and extra-curricular. As parts of pedagogic research computing resources in fundamental subjects such as Maths and Mechanics/Physics have been developed and been embedded into VLE system. The use of an Electronic Voting System in the classroom for summative and formative assessments is another example of pedagogic research undertaken by the teaching staff. This reflective, evidence-based professional practice by academic staff serves as exemplar to students in their future professional practice.

### Assessment for Learning

The assessment strategy has been designed to help students to learn and prepare them for employment rather than just a tool to measure their learning. The assessment is designed to be authentic, inclusive, and transparent. The assessment tasks focus on real world-engineering activities that enhance students' employability. All modules have explicit formative assessments to provide opportunities for practice and the chance to use 'feed forward' to help students improve their work in subsequent summative assessments. Examinations are still used as they are an effective way of assessing basic knowledge and understanding, and professional bodies expect to see examination covering key curriculum content. However, the strategy recognises that other assessment methods are better suited to assessing higher-level problem-solving skills. This is reflected in the decreasing use of examination from level 4 to level 6. The use of a well-balanced range of assessment methods is key part to of our inclusive assessment strategy. Group and teamwork assessment is instrumental in developing and recognising this important employability skill.

The programme is designed to develop the students' academic and technical knowledge and understanding, their academic and professional skills, and their personal qualities, and ultimately prepare them for employment. The assessment strategy has been designed in the same way: to develop the students rather than simply assess them to make sure they satisfy learning outcomes. The assessment is designed to be authentic, engaging, and transparent,

which contributes to helping students to learn and develop effective attributes. The assessment tasks focus on real world-engineering activities that enhance students' employability. A large variety of different assessment methods are used in the programme, and all modules in the programme have formal and informal assessment, and formative and summative assessment associated with them. The forms of assessment include online portfolio, online tests using Canvas, formative in-class tests, workbooks, practical exercises, tutorial questions, end-of-module examinations and even an individual viva exam which enables assessment of understanding of a broad range of aerospace topics. All the coursework that students complete is formative as well as summative. The formal and informal feedback from coursework and the informal assessment given enable the students to improve knowledge and skills. The informal feedback includes group discussion in classes, one-to-one dialogue, rehearsal of oral presentation, draft reports, and peer assessment.

## Engineering curriculum

AE4007/4008 Introduction to Aerospace Engineering/Astronautics introduces the fundamentals of aerospace and space technology. Level 5 of the core programme builds on the fundamental knowledge and skills gained at Level 4. It focuses on knowledge and understanding of the engineering principles underpinning aerospace technologies. The module Aerodynamics and Propulsion involves the use of wind tunnel facilities and a flight simulator to enhance students learning experience through Learning-By-Doing. The live Learjet business aircraft is used to demonstrate the typical operation of each of systems and to facilitate hands-on practice of real-world hardware. Staff encourage students to develop curiosity and a desire to learn for life using active learning techniques. The problem-based and inquiry-based group work fosters collaborative thinking and develops attributes expected of an aerospace graduate.

Aerospace Structures, Materials and Vibrations introduces the application of aerospace engineering principles to aerospace vehicle materials and structures under static and dynamic loading. The module enhances the development of students' analytical, problem-solving, critical thinking and laboratory skills. It provides an understanding of how the principles of structures, materials, and vibrations. The module involves the use of laboratory experiments in the areas of structures, composites, and vibrations.

Introduction to Space Vehicle Design provides students with a detailed understanding of space vehicle design and insight into the key components of a space vehicle. The module content is continually updated, reflecting the current space engineering practices and industrial requirements within UK, European and International space, to improve the students' employability within the space industry. Students will develop, hands-on practical skills and health & safety applied knowledge of the propulsion subsystem.

Introduction to Aerospace Design introduces a basic knowledge and understanding of aircraft aerodynamics, mechanical, avionic and propulsion systems, and in addition that Astro students understand the unique requirements of the space environment. It gives students a broad understanding of the aerospace/Astro/aircraft industry including its regulatory framework and terminology used.

Aerospace Electronics and Control Systems is designed to broaden students' knowledge and understanding of the control systems used in aerospace applications. The Explore and Project Management introduces the principles and commercial practices for the management of engineering projects and related wider business operations. The nature of project engineering and business management is considered in the context of time, quality, risk, and sustainability aspects. It introduces the legal, commercial, social, and ethical framework in engineering environments. This module provides opportunities for developing



team-working in industrially based group design activities which would enhance students' communication skills in group discussions and seminars.

Level 6 of the program continues the aerospace theme, but it emphasizes the development of self-management, independent learning, professional skills, and deep understanding of knowledge required in aerospace engineering. Further Aerodynamics and Further Aerospace Structures extends students' knowledge and understanding of aerospace aerodynamics and structure. The module enables students to solve problems in low-speed and high-speed aerodynamics, aerospace/spacecraft structure, load, and fatigue analyses. It equips students with the practical experience and skills of using commercial CFD and FEA ANSYS software in aerospace and space engineering applications. Flight Dynamics and Propulsion develops students' knowledge and understanding of aircraft performance, dynamic stability, and propulsion systems. The theories will be demonstrated in flight dynamics and performance through practical flight testing onboard a twin-engine turboprop aircraft. The module extends analyses of propulsive systems and covers the design principles for the evaluation of air-breathing cycles, axial flow turbomachines and combustion systems.

In Further Space Vehicle Engineering, students develop their understanding of systems engineering, requirement analysis, instrument and payload selection, mission analysis and orbit mechanics in spacecraft design. They will apply tools, analysis, and design principles to conduct the selection and sizing of core spacecraft electrical and mechanical subsystems.

In Aircraft/Space Technology Design Project and EG6026 Apply and Business Management, students are required to develop various key aspects of project planning and management before engaging in a group project based in the aerospace field and drawing on previous knowledge and experience. It will consist of substantial Project-Based Learning (PjBL) driven by the students with supervisor/facilitators to encourage professionalism and leadership in a group activity support. It provides students with an understanding of project planning and an opportunity to put theory into practice in a virtual industrial project. The module encourages professionalism and leadership in a collaborative group setting in which sustainability and ethics are embedded within the project context. The above two modules develop the analytical and problem-solving skills of the students.

Individual Project combines the technical and academic facets of the programme and provides students with an opportunity to complete a capstone project applying the knowledge and skills learnt during the course to achieve agreed deliverables. It enables students to develop their research skills using and applying information from the technical literature.

This section is for MEng Level 7 prog spec only:

Space Mission Analysis and Design builds on the Further Space Vehicle Engineering module providing experience in space mission analysis and design through a range of largely independent study activities, and is assessed through seminars, design, build and test, and short written assignments. The module further extends student knowledge of space engineering theory, its industrial application, and business planning. It will enhance the student's understanding of the conceptual design of propulsion and science/instrumentation payload hosting using low-cost approaches.

EG7703 Advanced Engineering Materials is designed to develop an in-depth understanding of material science and engineering associated with advanced materials, its development techniques, and coatings, together with materials selection methods employed by engineering consultants. It provides a deepening understanding of the relationship between

material design, manufacturing processes and material properties by giving examples from various industries. The module is structured to provide students with intellectual knowledge on advanced materials, which will allow them to enhance their employability perspectives or continue their research.

EG7704 Advanced Computational Fluid Dynamics is intended to extend students' knowledge and skills developed in Level 5 and 6. It introduces stress analysis, structure and mechanical properties of materials, Computational Fluid Dynamics (CFD) and Finite Element Analysis (FEA), emphasising advanced theories behind CFD and FEA.

EG7705 Advanced Structural Analysis covers advanced applications of FEA and structural dynamics. For FEA, basic theories of analysing stresses, deflections, and temperatures are covered. For structural dynamics, the primary parameters associated with vibration are analysed; these include natural frequencies, damping, mode shapes and responses under operating dynamic loads. Examples of good practices for safe and effective application are presented. This module will enable students to gain an understanding of the fundamental theory of FEA and structural dynamics.

Aerospace Design & Analysis is designed to meet the core requirement for students in the MSc Aerospace Engineering course by introducing FEA and CFD technologies and skills for solving advanced aerospace design and analysis problems, utilizing practical workshops using commercial FEA and CFD software. The first half of the module aims to introduce the principles of the modelling statics and dynamics problems with FEA and critically assess and evaluate the results. The module's second half aims to familiarise with how to use CFD software to solve flow aerodynamics and heat transfer problems. In the practical sessions, emphasis is placed on solving structural and aerodynamic problems in a realistic aerospace engineering context and on allowing students to develop an awareness of the limitations of FEA and CFD software and to develop an understanding of good practice in their applications.

ME7753 Advanced CAD/CAM Systems covers advanced Computer-aided design and is heavily focussed on rapid manufacturing methods. The module covers advanced computer-aided design and manufacturing techniques in the conceptual design and manufacture and is heavily focussed on the rapid manufacturing methods involving mould design, machining tool path optimisation & full machining simulation verification, and machining collision avoidance.

#### Inclusive Curriculum Framework

The KU Inclusive Curriculum Framework and Curriculum Design Principles are intended to support our diverse student population to fulfil their full potential and to see themselves reflected in the engineering curriculum. Students will be encouraged to see themselves as belonging to a professional community. The development of reflection and employability skills is another key aspect of the programme that equip our graduates with Future Skills required to work in a diverse and sustainable global environment.

A set of employability criteria will be identified using insight from employers and the Employability Team. We will identify skills that employers think is needed from graduates using alumni or the Royal Aeronautical Society. This involves the support from Development, Alumni Relations, and Engagement team to identify alumni who graduated at least a year ago. Each module will be examined to determine the opportunity to embed employability into the curriculum. Academic staff and members of the employability team will identify appropriate tailored opportunities to bridge any gaps. Personal Tutors will enhance student engagement with these opportunities. Learning and teaching staff will highlight opportunities within their sessions that enable students to acquire employability skills. Students will

develop Continuous Professional Development (CPD) plans in digital portfolios to draw upon in applications and interviews. Personal Tutor Scheme includes employability criteria and reflective questions in first meeting and records on the system.

The variety of teaching activities also takes account of the student's different learning preferences and experiences and there is a careful balance of individual and group-based activities. Marking criteria are provided for all assessments as part of the assessment booklet at the beginning of the year for each module and care is taken to ensure that the language used is clear. Assessment and marking criteria for all substantial assessments are discussed in class so all students have an opportunity to interrogate the criteria. Staff Student Consultative Committees and Boards of Study provide opportunities for students to make suggestions on how to develop a more inclusive curriculum by considering the specific

## **E. Support for Students and their Learning**

Student support recognises that the student experience is unique to each student. A key part of our approach to an inclusive curriculum is that we acknowledge and where possible accommodate their individual circumstances. The is central to the efforts to Personal Tutorial System (PTS) is provide a personalised learning experience. At levels 4, 5 and 6, the PTS is integrated within the AE4021 Navigate for the Professional Engineer, EG5016 Exploring Engineering Project Management and EG6026 Applied Business Management modules. Timetabled tutorial sessions provide an opportunity for regular discipline-focused small-group discussions cantering around study skills, personal development, and self-reflection of their learning journey. Employability skills are reflected throughout the modules. Students are expected to apply their subject-specific and design thinking skills as part of an interdisciplinary team challenged to solve a sustainability problem.

Discussion of professional skills competencies, pathways to professional chartership/membership and co-curricular activities will be key part of the PTS sessions. Students are required to upload their progress on these activities onto the Digital Portfolio created on the University VLE Canvas system. The Digital Portfolio will be available to the relevant personal tutors for further discussion during one-to-one meetings. There will be milestones for students to meet at every level, and it will be one of the personal tutor's roles to monitor the students' progress and give appropriate advice. Where difficulties are encountered PTs will be able to help or direct students to available support, including peer mentoring schemes, PAL, Maths aid and online resources etc. Students will develop their professional profile in CV and LinkedIn through the EG6026 Apply module.

Students are supported by:

- A Module Leader for each module
- A Course Leader to help students understand their programme structure and provide academic support.
- A Personal Tutor (PT) to provide academic and personal support.
- There is a Student Support and Engagement Team to help students with any problem that is affecting their studies.
- A dedicated Undergraduate Course Administrator
- An induction programme and study skills sessions at the start of each academic year
- SEC Academic Success Centre (SASC) is a one-to-one drop-in Study Skills session for students every weekday. Help is available on a range of academic skills from writing reports, note-taking, to exam revision, referencing, programming and mathematical skills.

- VLE – a versatile on-line interactive intranet and learning environment accessible both on-site and remotely.
- Course Representative scheme
- Talent A University Careers and Employability Service
- Comprehensive University support systems including the provision of advice on finance, regulations, legal matters, accommodation, international student support, disability, and equality support.
- The Students' Union
- An Academic Team that seeks to maintain an open-door policy in the spirit of supporting students.

The Level 6 Personal Tutorial System (PTS) is integrated within the EG6026 Apply module and timetabled tutorial sessions provide an opportunity for regular discipline-focused small-group discussion and debate and reinforces the key themes and practices of the taught programme. Personal Tutors would have access to all the formative and summative assessment results of their tutees and would be responsible to discuss them with their tutees and assist them to prepare plans for further improvements and advise on any academic issues they may have. The personal tutors are also responsible for giving a bigger and more complete picture of learning, teaching, learning outcome and assessment and their linkage to the tutees.

## **F. Ensuring and Enhancing the Quality of the Course**

The University has several methods for evaluating and improving the quality and standards of its provision. These include:

- External examiners
- Boards of study with student representation
- Annual Monitoring and Enhancement
- Continuous Monitoring of courses through the Kingston Course Enhancement Programme (KCEP+)
- Student evaluation including Module Evaluation Questionnaires (MEQs), level surveys and the National Student Survey (NSS)
- School Moderation policies
- Feedback from employers
- Accreditation by the Royal Aeronautical Society.
- Internal Subject Review (ISR).

## **G. Employability and work-based learning**

The Future Skills teaching is now embedded within the engineering curriculum as a central part of the University's strategic plan focused on delivering the skills for innovation required by the industry. This will enable our graduates to design solutions to address complex challenges within and beyond their subject disciplines. Initially students are guided towards learning about employability skills and career pathways, but as they move through the course, they are expected to become more independent and take ownership of their career development by engaging with services provided by Handshake from the Careers and Employability Services including Webinars, workshops, and employer events. They also provide advice on Professional Communication, Time and Self-Management and Identifying and Articulating Skills. Navigate, Explore and Apply modules will be used to support the delivery of employability skills teaching and development of graduate attributes. There are also opportunities to perfect skills required to gain employment such as CV writing, Psychometric Test and Using LinkedIn. A student's development and career options are

discussed in personal tutor meetings and guidance given as appropriate. This is in liaison with the Careers and Employability Services teams.

**Graduate Destinations:**

- Qinetiq QinetiQ Security & Defence Contractors
- Rolls Royce Rolls-Royce: Pioneering Cutting-Edge Technologies
- Airbus Industries Home | Airbus | Pioneering sustainable aerospace
- Surrey Satellites Home | Small Satellite supplier | Surrey Satellite Technology Ltd | SSTL
- Lockheed Martin Lockheed Martin UK | Lockheed Martin
- British Airways British Airways - Careers (ba.com)
- Thales Thales - Building a future we can all trust (thalesgroup.com)

**Work-based learning, including sandwich courses and higher or degree apprenticeships**

Work placements are actively encouraged – although it is the responsibility of individual students to source and secure such placements. This allows students to reflect upon their own personal experience of working in an applied setting, to focus on aspects of this experience that they can clearly relate to theoretical concepts and to evaluate the relationship between theory and practice.

**H. Other sources of information that you may wish to consult**

Engineering Council UK-SPEC  
<https://www.engc.org.uk/ukspec>  
 Royal Aeronautical society Accreditation Handbook:  
<https://www.aerosociety.com>

**I. Development of Course Learning Outcomes in Modules**

This table maps where course learning outcomes are **summatively** assessed across the modules for this course. It provides an aid to academic staff in understanding how individual modules contribute to the course aims, a means to help students monitor their own learning, personal and professional development as the course progresses and a checklist for quality assurance purposes.

Module Code	Level 4					Level 5					Level 6					Level 7												
	AE4007	AE4021	EG4024	EG4019	EG4023	EG4017	AE4008	AE5042	AE5034	AE5023	AE5027	AE5028	AE5031	EG5016	AUG-26-	AUG-26-	EG6026	AUG-26-	AUG-26-	EG6018	AUG-26-	Aug-26-	Aug-26-	EG7704	EG7705	EG7703	AE7761	EG7001
Knowledge	A					S			S												S				S			

