Programme Specification for Undergraduate Programme Leading to:
BEng Aerospace Engineering
BEng Aerospace Engineering with Placement

*Applicable for all undergraduate students **starting at FHEQ Level 4** in 2022*

Version No.	Date	Notes – QA USE ONLY	QAO
2022-23 v1	*18/07/2022*	*New specification for Sep 2022, L4 LOs rewritten to meet AHEP4, L4 blocks restructured to 15 credits, variation to SR2 added*	*SK*

Undergraduate Programme	
1. Awarding institution	Brunel University London
2. Teaching institution(s)	Brunel University London
3. Home college/department/division	College of Engineering, Design and Physical Sciences / Department of Mechanical and Aerospace Engineering
4. Contributing college/department/division /associated institution	Department of Mathematics; Department of Civil Engineering, Department of Electronic and Electrical Engineering, Department of Chemical Engineering Brunel University London Pathway College (BPC) offers the following Validated Programme Element/s which enable progression on to this programme: • Alternative Foundation in Engineering
5. Programme accredited by	Institution of Mechanical Engineers (IMechE). Royal Aeronautical Society (RAeS)
6. Final award(s) and FHEQ Level of Award	BEng (Hons) Aerospace Engineering (FHEQ level 6) BEng (Hons) Aerospace Engineering with Placement FHEQ level 6)
7. Programme title	BEng Aerospace Engineering
8. Programme type (Single honours/joint)	Single Honours
9. Normal length of programme (in months) for each mode of study	36 months FT; 48 months Sandwich For students commencing their studies at BPC, the normal length stated above will vary as follows: • Foundation Year - September commencement: + 12 months • Foundation Year - January commencement: + 9 months
10. Maximum period of registration for each mode of study	Normal length of programme (as defined above in 9) + 3 years
11. Variation(s) to September start	None See BPC Validated Programme Element Specifications for intakes for those programmes.
12. Modes of study	Standard
13. Modes of delivery	Full-time; Thick Sandwich
14. Intermediate awards, and titles with FHEQ level of award	CertHE Aerospace Engineering (FHEQ level 4) DipHE Aerospace Engineering (FHEQ level 5) DipHE Aerospace Engineering with Placement (FHEQ level 5) BEng (Ord) Aerospace Engineering (FHEQ level 6) BEng (Ord) Aerospace Engineering with Placement (FHEQ level 6)
15. UCAS Code	FT: H402; SW: H401
16. HECoS Code	100115 (Aerospace Engineering)
17. Route Code	H400UEAERSPA
18. Relevant subject benchmark statements and other external and internal reference points used to inform programme design	UK Quality Code for Higher Education QAA Subject Benchmark Statement (Engineering) Brunel 2030

	Brunel Placement Learning Policy, as published under the 'Placements' section of the 'Managing Higher Education Provision with Others' page. Useful Pdf links: the Engineering Benchmark Statement (http://www.qaa.ac.uk/en/Publications/Documents/Subject-benchmark-statement-Engineering-.pdf) the Framework for Higher Education Qualifications (http://www.qaa.ac.uk/en/Publications/Documents/qualifications-frameworks.pdf) Engineering Council: UK-Spec (https://www.engc.org.uk/ukspec) The Institution of Mechanical Engineers: Academic Accreditation Guidelines (https://www.imeche.org/docs/default-source/tapd/acd001-annex-1-academic-accreditation-guidelines.doc?sfvrsn=4) Royal Aeronautical Society: Academic accreditation guidelines (https://www.aerosociety.com/membership-accreditation/accreditation/academic-courses/) Brunel's Programme Approval Policy (http://www.brunel.ac.uk/about/quality-assurance/documents/pdf/Programme-Approval-Policy.pdf),
19. Admission Requirements	Details of entry requirements are provided on the University's and College website. Levels of English for non-native speakers are outlined on Brunel International's language requirements pages. For admission via Brunel University London Pathway College, see the relevant Validated Programme Element Specification.
20. Other relevant information (e.g. study abroad, additional information on placements)	• The programme of study will involve visits to Aerospace engineering industry, timetabled outside the above programme of study. • A number of individual projects at Level 6 are expected to be on topics suggested and partly supervised by industry. • Industrial placement takes place in an aerospace related industry.
21. Programme regulations not specified in Senate Regulation 2. Any departure from regulations specified in Senate Regulation 2 must be stated here and approved by Senate.	Variation to SR2.16 – Level 6 Major Individual Project (30 credits) instead of 40 credits. Approved by Senate 23 September 2020. For an accredited award, students may not be allowed an aegrotat pass on any module or have more than 30 credits of allowed failure (E-, E or E+) throughout their entire profile.
22 Further information about the programme is available from:	Course webpage: https://www.brunel.ac.uk/study/undergraduate/Aerospace-Engineering-BEng

23. EDUCATIONAL AIMS OF THE PROGRAMME

The Aerospace Engineering programme at Brunel University London is part of the Brunel Engineering Curriculum portfolio. As such, its aim is to produce graduates that are creative, knowledgeable, have perspective and are professional in their approach.

The programme will produce graduates with knowledge and understanding of their subject and its applications. The graduates, equipped with analytical and computational skills, design, and transferable skills, will be able to play leading professional roles in the aerospace and related industries, show initiative, take responsibility and able to making decisions in complex and unpredictable situations. The programme also aims to develop new areas of teaching in response to the needs of industry and community.

24. PROGRAMME AND INTERMEDIATE LEARNING OUTCOMES

The programme provides opportunities for students to develop and demonstrate knowledge and understanding (K) cognitive (thinking) skills (C) and other skills and attributes (S) in the following areas:

Level	Category (K = knowledge and understanding, C = cognitive (thinking) skills, S = other skills and attributes)	Learning Outcome	Associated Assessment Blocks Code(s)	Associated Study Blocks Code(s)	Associated Modular Blocks Code(s)
4					
1	K	Knowledge, understanding, skills gathering and comprehension of the specific engineering disciplines relevant to Aerospace engineering, including systems, mechanics and materials.			BE1607 BE1608 BE1610 BE1611 BE1612 BE1606 ME1621
2	C	Assess problems to reach sound conclusions using first principles of mathematics, statistics, natural science and engineering principles.			BE1609 BE1610 BE1611 BE1612 BE1606 ME1621
3	C	Apply appropriate computational and analytical techniques to model problems.			BE1607 BE1608 BE1610 BE1611 BE1612 BE1606 ME1621
5	K,C,S	Design solutions for engineering and other problems, with consideration of a range of societal, environmental and professional factors.			BE1609
6	K,C	Apply an integrated or systems approach to the solution of an engineering problem.			BE1609 BE1612 BE1606
7	K	Describe the environmental and societal context of solutions to complex engineering problems and minimise adverse impacts.			BE1609 BE1610 BE1611
8	C, S	Identify ethical concerns in an engineering context.			BE1609
9	K	Explain the basic principles of risk management in an engineering context.			BE1609

10	K	Describe the nature of security risks in an engineering context.			BE1609
12	C,S	Effectively report on the use of practical laboratory and workshop skills to assess engineering problems.			BE1610 BE1611 BE1612 BE1606 ME1621
13	K,S	Describe appropriate materials, equipment, engineering technologies and processes.			BE1612 BE1606 ME1621
16	S	Demonstrate an understanding of how they function as an individual, and as a member of a team.			BE1609
17	S	Communicate effectively on engineering matters.			BE1609 BE1610 BE1611 BE1612 BE1606 ME1621
18	S	Effectively record and reflect on self-learning and development.			BE1609

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	K [SM1b]	A comprehensive synthesis and understanding of the principles, concepts and theories underpinning the study of aerospace engineering.			ME2610 ME2611 ME2619 ME2614 ME2620 ME2616 ME2617
	K [SM2b]	Knowledge and critical understanding of fundamentals of mathematical and statistical methods underpinning the education in aerospace engineering.			ME2610 ME2619 ME2620
	K [SM3b]	Ability to use other engineering disciplines and evaluate critically the appropriateness of different approaches in order to support the study for aerospace engineering.			ME2610 ME2619 ME2614 ME2616 ME2617
	K, C [EA1b]	Understanding of engineering principles and the ability to apply them to undertake critical analysis of key aerospace engineering processes.			ME2611 ME2619 ME2614 ME2620 ME2616 ME2617
	C [EA2]	Ability to use analytical methods and modelling techniques for the			ME2610 ME2611 ME2619

		understanding and assessment of systems in aerospace engineering.			ME2614 ME2616 ME2617
	C [EA3b]	Use of alternative approaches, with understanding of the their limits,for the quantitative analysis and modelling of systems and structures for aerospace engineering.			ME2610 ME2619 ME2614 ME2620 ME2617
	K, C [EA4b]	Understanding of, and the ability to apply, an integrated or systems approach to solving complex aerospace engineering problems.			ME2610 ME2611 ME2619 ME2620 ME2616

	K [D1]	Understanding the business and customer needs.			ME2612 ME2619 ME2620
	K [D2]	Understanding design process methods applied to engineering components and systems			ME2611 ME2620
	K [D3b]	Work with information that may be incomplete or uncertain, quantify the effect of this on the design and, where appropriate, use theory or experimental research to mitigate deficiencies			ME2611 ME2614 ME2617
	C [D4]	Designing engineering components for practical mechanical engineering systems.			ME2611 ME2620
	K, C [D5]	Apply advanced problem-solving skills, technical knowledge and understanding, to establish rigorous and creative solutions that are fit for purpose for all aspects of the problem			ME2611 ME2620
	S [D6]	Effective communication of technical material, in the form of written reports and oral presentations, and time management.			ME2610 ME2614 ME2616 ME2617
	K [EL1,EL2, EL3b,EL6, P1,P4, P6, P8,P11b]	Understanding of the role of aerospace engineering in industry and commerce, including legal, health and safety requirements, quality issues as well as the role of the professional aerospace engineer and aerospace regulatory bodies.			ME2612
	K,C EL4	Understanding of the requirement for engineering activities to promote sustainable development and ability to apply quantitative techniques where appropriate.			ME2612 ME2620
	K, C				ME2611

	[P2]	Comprehensive understanding of the characteristics of materials and processes for aerospace engineering.			ME2619 ME2614
	C, S [P3]	Ability to apply relevant practical and laboratory skills, including data acquisition and interpretation of experimental data.			ME2619 ME2614 ME2620 ME2616 ME2617

	K, S [P4]	Understanding of the use of technical literature and other information sources for the conceptual aircraft design. Ability to develop writing skills for aircraft design.			ME2612 ME2619 ME2620
	S [G1]	Basic information technology and communication (ITC) principles and writing skills relevant to aerospace engineering.			ME2610 ME2620
	S [G1,G2,G3b,G4]	Understanding of the use of technical literature and other information sources for self-learning for conceptual aircraft design. Monitor and adjust proper planning for aircraft design and ability to exercise personal responsibility.			ME2612
	S	Adapt to the change in expectations and environments found during an industrial placement. ('with Placement' awards.			ME2555
6					
	K, C [SM1b]	A comprehensive synthesis and systematic understanding of the principles, concepts and theories underpinning the study of aerospace engineering.			ME3620 ME3629 ME3618 ME3630 ME3631 ME3632
	K, C [SM2b]	Systematic understanding and knowledge of fundamentals of mathematical and statistical methods underpinning the education in aerospace engineering.			ME3620 ME3629 ME3618 ME3619
	S [SM3b]	Ability to use other engineering disciplines and deploy established techniques in order to support the study for aerospace engineering.			ME3629 ME3618 ME3630 ME3631
	K, C [EA1b]	Systematic understanding of engineering principles and the ability to apply them to			ME3620 ME3629

		undertake critical analysis of key aerospace engineering processes.			
	K, S [EA2]	Ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques.			ME3620 ME3629 ME3630
	K, C, S [EA3b]	Ability to apply quantitative and computational methods for the analysis and modelling of systems and structures for aerospace engineering.			ME3629 ME3618 ME3630
	C [EA4b]	Systematic application of appropriate techniques that may include theories, formulae, data, and experimental and/or numerical techniques to solve in an integrated manner aerospace problems presented by the project.			ME3620 ME3629 ME3631 ME3632
	C [EA6]	Ability to extract and evaluate pertinent data and to apply engineering analysis techniques in the solution of unfamiliar problems.			ME3620
	K [D1]	Systematic understanding the multi-disciplinary nature of sustainability and stakeholder dynamics.			ME3619
	K, S [D2]	Systematic understanding and appraisal of the aerospace problem using a review of related literature and technical reports, including quality, environmental, health and safety issues. Evaluation and simplification of the aerospace problem and validation of the results.			ME3620 ME3619
	C [D3b]	Critical assessment and analysis of results with appreciation of uncertainty, ambiguity and limits of knowledge in aerospace engineering projects.			ME3620 ME3630 ME3619
	K, C, S [D4]	Comprehensive knowledge of principles in the engineering design process, including objectives and methods to			ME3620

		identify design requirements and apply formulae, data and experimental and/or numerical techniques for aircraft design.			
	K,C D5	Systematic planning and management of the design process, including cost drivers, and evaluate outcomes.			ME3620
	C, S [D6]	Effective communication of technical material, in the form of written reports and oral presentations, and time management.			ME3630 ME3629 ME3620
	K [EL1]	Systematic understanding of the need for a high level of professional and ethical conduct in engineering and knowledge of professional codes of conduct.			ME3619 ME3632
	K [EL2]	Comprehensive knowledge of environmental, quality, health and safety issues and relevant regulations in engineering business and appreciate the multi-disciplinary nature of sustainability and stakeholder dynamics, to ensure ethical and professional conduct as practicing engineers.			ME3619
	K, S [EL3b,EL4]	Systematic application of methods in the analysis, planning, resourcing, progressing, monitoring and control of aerospace engineering projects in a sustainable and, if possible, in a quantitative way.			ME3620 ME3619
	K, S [EL5]	Systematic understanding of the role of aerospace engineering in industry and commerce, including legal, health and safety requirements, quality issues as well as the role of the professional aerospace engineer and aerospace regulatory bodies.			ME3619
	K, S [EL6]	Systematic understanding of the role of aerospace engineering in industry and commerce, including legal, health and safety requirements,			ME3619 ME3632

		as well as risk assessment and risk management techniques.			
	K, S [P1]	Systematic understanding of the background to the problem using a review of related literature and technical reports. Appreciation of the context in which engineering knowledge is applied.			ME3620 ME3629
	K [P2]	Comprehensive knowledge of characteristics of particular equipment, processes or products, with extensive knowledge and understanding of a wide range of engineering materials and components.			ME3630 ME3620
	S [P3]	Ability to apply relevant practical and laboratory skills.			ME3629 ME3618
	K [P4]	Systematic understanding of the background to the problem using a review of related literature and technical reports. Appreciation of the context in which engineering knowledge is applied. .			ME3620 ME3629 ME3618 ME3619

	K, S [P6]	Systematic understanding of the role of aerospace engineering in industry and commerce, including legal, health and safety requirements, quality issues as well as the role of the professional aerospace engineer and aerospace regulatory bodies.			ME3620 ME3630 ME3619
	K, S [P7]	Awareness of quality issues and their application to continuous improvement.			ME3619
	C [P8]	Critical assessment, analysis and interpretation of results for the aerospace engineering project.			ME3620 ME3619
	S [P11]	Systematic understanding of different roles within an engineering team and the ability to exercise initiative and personal responsibility, which may be as a team member or leader.			ME3619
	S [G1]	Apply their skills in problem solving, communication, information retrieval, working with others and the effective use of general IT facilities.			ME3620 ME3629 ME3619
	S [G2]	Self-awareness of one's own skills and how these may be improved, thus understanding the employability qualities necessary for work requiring the exercise of initiative, professionalism and personal responsibility.			ME3619
	S [G3b]	Comprehensive project planning with identifiable objectives/milestones and time scale, and complete the project under given time and resource constraints. Effectively communicate the ideas and results within a written report and/or oral form.			ME3620 ME3632
	S [G4]	Exercise initiative and personal responsibility, which may be as a team member or leader.			ME3620 ME3619

Learning/teaching strategies and methods to enable learning outcomes to be achieved, including formative assessments

Study
Students will be introduced to subject material, including key concepts, information and approaches, through a mixture of standard lectures, tutorials and seminars, laboratory activities, field work, self-study and individual research reports. Supporting material will be provided via the University's e-Learning platform. The aim is to challenge students and inspire them to expand their own knowledge and understanding.

Work
Preparation for work will be achieved through the development of 'soft' skills such as communication, planning, management and team work. This will be supported by the University's central services, principally the Library and ASK teams. In addition, guest speakers from industry will provide a valuable insight into the real world of aerospace engineering.

Play
Many of the practical activities in which the students engage develop into enjoyable experiences, for example working in teams for laboratory work and field work. Various engineering and technology societies, run by the students (with staff support) form the focus for many extra-curricular activities for all students within the Mechanical and Aerospace Engineering Department.

Grow
Students are encouraged to develop personal responsibility throughout the course. Many elements of coursework involve, and reward, the use of initiative and imagination. Students are guided into this through the use of one-to-one tutorials. This aids them in developing reflective skills. Students on the Placement route record their personal development as part of the placement assessment and are assisted in this by their industrial placement tutor and employer.

Experienced engineers working in industry will deliver selected parts of the programme, ensuring students are exposed to the practicalities of the industry and understand more of the world of work. A group poster conference (part of BE1609) will take place towards the end of FHEQ L4, with a range of industrial specialists invited to examine the posters and talk with the students. Students will also have the opportunity to work on industry-related projects at FHEQ L6.

The opportunity to think creatively will be given at all levels, particularly:

FHEQ L4: BE1609 Engineering Practice; ME1621 Mechanical Engineering Science
FHEQ L5: ME2611 Design Process for Machine Elements, Manufacturing Processes, Materials and CAD; ME2620 Aircraft Design
FHEQ L6: ME3620 Major Individual Project

Summative assessment strategies and methods to enable learning outcomes to be demonstrated.

To ensure any course related documentation is flexible and CMA compliant all assessments will be specified on module outlines as one of the following three:

- *Coursework*
- *In-person assessment*
- *Examination*

Every assessment type falls within these three categories.

Coursework
For example

- Essays – to develop skills in research (collecting, managing and interpreting evidence)
- Laboratory reports – to develop skills in interpretation of experimental, theoretical and computational findings and skills in communicating a systematic process and results
- Assignment to develop transferable skills
- Design labs – to develop and assess engineering design skills (including basic information, technology and computer aided design skills) and visual and written communication
- Individual major report - to develop advanced abilities in research and communication, further develop engineering design, development and/or analysis skills and assess knowledge and understanding
- Group reports – to develop team skills and assess understanding of the interactions between engineering design, development and analysis processes
- Project portfolios - to develop skills in gathering, integrating, evaluating and presenting information and data from a variety of sources

In-person assessment
Any assessment were the actions (verbal or non-verbal) of the student are being assessed in their presence and thus for which the student must be in attendance.

- Oral presentations – to develop and assess verbal presentation skills

Examination

- Examinations will be used to assess knowledge and understanding, ability to solve engineering problems and present a reasoned argument.

25. Programme Structure, progression and award requirements

Programme structures and features: levels, assessment blocks, credit and progression and award requirements

- **Compulsory block:** one which all students registered for the award are required to take as part of their programme of study. These will be listed in the left hand column;

- **Optional block:** one which students choose from an 'option range'. These will be listed in the right hand column**;**

- A **core assessment** is an assessment identified within an assessment block or modular block (either compulsory or optional) which must be passed (at grade D- or better) in order to be eligible to progress and to be eligible for the final award. All core assessments must be specified on the programme specification next to the appropriate assessment or modular block:

  Where students are expected to pass the block at D- or better, but not necessarily all elements, then the block itself is core.
  e.g. AB3000 Project (40)
  Core: Block

  Where only some elements of assessments are required to be passed at D- or better, these will be identified by listing each element that is core
  e.g. ABXXX1 Title (XX credits)
  Core: 1 & 4
  Where students are expected to pass all assessments in a block then this will be identified. By setting the assessment this way, students are also required to pass the block by default. This will be identified thus:
  e.g. ABXXXX Title (XX credits)
  Core: All, Block

- A **non-core assessment** does not have to be passed at grade D- or better, but must be better than a grade F, in order to progress and to be eligible for the final award.

Foundation Year
Foundation Year structures are specified in the relevant Validated Programme Element Specifications. These documents also specify the progression requirements to FHEQ Level 4.

Level 4	
Compulsory assessment block codes, titles and credits	**Optional assessment block codes, titles and credits**
Compulsory study block codes, titles and credit volume	**Optional Study block codes, titles and credit volume**

Compulsory modular block codes, titles and credits	Optional modular block codes, titles and credits
BE1607_CB Engineering Mathematics & Programming1– (15 credits) - **Core Block** BE1608_CB Engineering Mathematics & Programming2 – (15 credits) - **Core Block** BE1609_CB Engineering Practice – (15 credits) - **Core Block** BE1610 Engineering Systems and Energy1 – (15 credits) BE1611 Engineering Systems and Energy2 – (15 credits) BE1612 Engineering Mechanics - Statics – (15 credits) BE1606 Engineering Mechanics and Materials II (15) ME1621 Mechanical Engineering Science (15)	
Level 4 Progression and Award Requirements As per Senate Regulation 2	

Level 5	
Compulsory study block codes, titles and credits ME2554 Mechanical Engineering Pre-placement (0 credits)	**Optional study block codes, titles and credits** None
Compulsory modular block codes, titles and credits **15 Credit Blocks:** ME2610 Engineering Mathematics and Programming ME2611 Design Process for Machine Elements, Manufacturing Processes, Materials and CAD ME2612 Engineering Business **Core: Block** ME2619 Aerodynamics and CFD ME2614 Solid Mechanics and Intro to FEA ME2620 Flight Mechanics and Aircraft Design ME2616 Thermodynamics and Heat Transfer ME2617 Dynamics of Machines	**Optional modular block codes, titles and credits** None
Level 5 Progression and Award Requirements As per Senate Regulation 2	

Level 5 – Sandwich Placement	
Compulsory modular block codes, titles and credits This assessment block is only a requirement for the 'with Placement' awards. ME2555Work Placement (120) **Core: Block**	**Optional modular block codes, titles and credits** None

Level 5 Placement Progression and Award Requirements

As per Senate Regulation 2

For BEng Aerospace with Placement, ME2555will contribute 25% of the Level 5 profile and 8.33% of the overall degree calculation.

Module ME2555must be undertaken between Levels 5 and 6. Students must also register on the IMechE MPDS scheme. Students must also register on the IMechE MPDS scheme. if they wish for their placement year to be accredited by the IMechE. If a student does not register it will not affect the title of the award made by the University.

For DipHE Aerospace Engineering, ME2555 will contribute 25% of the Level 5 profile.

Level 6

Compulsory modular block codes, titles and credits	**Optional modular block codes, titles and credits**
All blocks are 15 credits unless otherwise specified ME3620 Major Individual Project (30) **Core: 1 and 3** The student chooses the individual project topic in ME3620, subject to staff approval. The individual project topic must be directly relevant to aerospace engineering. ME3629 Applied Aerodynamics ME3618 Mechatronics and Control Engineering ME3630 Aerospace Structures ME3619 Sustainable Engineering Management and Practice **Core: Block** ME3631 Aircraft Propulsion ME3632 Space Mechanics and Airworthiness	None

Level 6 Progression and Award Requirements

As per Senate Regulation 2

For BEng Aerospace Engineering with Placement, ME2555 will contribute 8.33% of the overall degree weighting.

For an accredited award, students may not be allowed an aegrotat pass on any module or have more than 30 credits of allowed failure (E-, E or E+) throughout their entire profile.

Please note: this specification provides a concise summary of the main features of the programme and the learning outcomes that a student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. More detailed information on the learning outcomes, content and teaching, learning and assessment methods can be found in the modular block, assessment and study block outlines and other programme and block information. The accuracy of the information contained in this document is reviewed by the University from time to time and whenever a modification occurs.