University of the West of England
BRISTOL

PROGRAMME SPECIFICATION

Part 1: Information	
Awarding Institution	UWE Bristol
Teaching Institution	University Centre Weston (UCW) (levels 1 and 2 (in part)), UWE Bristol (levels 2 (in part) and 3).
Delivery Location	UCW (as above) UWE Bristol (as above)
Study abroad / Exchange / Credit recognition	Not applicable
Faculty responsible for programme	Faculty of Environment and Technology
Department responsible for programme	Engineering, Design and Mathematics
Professional Statutory or Regulatory Body Links	Extension of accreditation from Royal Aeronautical Society will be applied for UCW direct entry
Highest Award Title	BEng(Hons) Aerospace Engineering (Manufacturing)
Default Award Title	Not applicable.
Interim Award Titles	BEng Aerospace Engineering (Manufacturing) DipHE Aerospace Engineering (Manufacturing) CertHE Aerospace Engineering
UWE Progression Route	
Mode of Delivery	Year 1 full-time (attendance); Years 2, 3 and 4 part-time (attendance)
ISIS code/s	
For implementation as part of an apprenticeship from	September 2017
Apprenticeship Standard and type	Aerospace Engineer (non-integrated)
Main training provider	UCW
UWE's role (if UWE is not the main training provider)	Awarding institution and delivery sub-contractor
End Point Assessment Institution/Organisation	Employer / Professional Engineering Institution
Additional training provider(s)	Not applicable

Part 2: Description

The Aerospace Engineering Apprenticeship Standard defines the mandatory qualification requirements which all apprentices must achieve in order to complete an apprenticeship. Alongside the development of foundation and development competencies, apprentices must achieve a BEng(Hons) which will be stipulated by the employer and must be accredited by an Engineering Council licenced Professional Engineering Institution. . Extension of our current accreditation from the Royal Aeronautical Society will be applied for at the next available opportunity to cover direct entry from UCW. For full details how the BEng(Hons) Aerospace Engineering (Manufacturing) aligns to the Apprenticeship Standard please see **appendix 1**.

The aims of the programme are that graduates will be able to:

- Apply established and novel engineering concepts to the solution of problems involving the design, operation and manufacture of aircraft;
- Model aerospace engineering systems so as to be able to specify and assess the technical design;
- Understand the manufacturing, financial and marketing implications of design proposals;
- Identify the links between design, manufacturing and production management
- Investigate problems and identify constraints including environmental and sustainability limitations, health and safety and risk assessment issues
- Operate effectively either as individuals or as members of a multi-disciplinary team;
- Communicate effectively both orally and in written form;
- Make considered judgments and decisions on complex engineering issues in which not all facts and consequences are accurately known;
- Effectively pursue independent study and undertake enquiry into novel and unfamiliar concepts and implementations.

Programme requirements for the purposes of the Higher Education Achievement Record (HEAR)

This programme forms the knowledge qualification for a level 6 degree apprenticeship Aerospace Engineer and is designed to produce graduates with a detailed understanding of aeronautical science, experiment and practice. Graduates from this programme are equipped to apply their knowledge and skills to aerospace manufacturing problems that arise in industry..

Graduates from this programme will be equipped to work in multi-disciplinary teams, able to critically appraise existing ideas and practice and produce creative solutions to engineering problems.

Regulations

Delete one of the following statements as appropriate

A: Approved to University Regulations and Procedures

Part 3: Learning Outcomes of the Programme	
A Knowledge and understanding of 1. The principles governing the behaviour of aerospace components and systems. 2. Mathematical methods appropriate to aerospace engineering and related fields. 3. The properties, characteristics and selection of materials used in aerospace components and systems. 4. Core engineering science and technologies with greater depth in areas pertinent to aero/mechanical systems. 5. The principles of information technology and data communications from a user's perspective. 6. Management principles and business practices, including professional codes of conduct such that critical ethical considerations can be made 7. The complexity of large-scale engineering manufacturing systems and projects. The above skills meet the SEEC Level Descriptors for level 1, 2 and 3 learning outcomes.	**Teaching/learning methods and strategies:** Acquisition of 1 to 7 is through a combination of formal lectures, tutorials, laboratory work, guided project work, group assignments, independent projects and case studies. The programme of study is designed to introduce basic knowledge and understanding of the technologies underpinning engineering, design and product development through a range of level 1 modules. This basic knowledge is developed through a range of taught and project modules at level 2, and further integrated through group design and project work at levels 3 This approach satisfies outcomes 1-5. Advanced tools and technologies are studied in the final years of the programmes. Outcome 6 is achieved through the business practice modules of UFMF8C-15-2 (WBL) Project Management and UFMFM7-15-3 Business Environment. Throughout the student is encouraged to undertake independent reading both to supplement and consolidate what is being taught/learnt and to broaden their individual knowledge and understanding of the subject. **Assessment:** Testing of the knowledge base is through assessed course work, through tasks undertaken under examination conditions, through oral presentations and assessed practical work done in various laboratories.
B Intellectual Skills	
Intellectual Skills Students will develop: 1. The ability to produce novel solutions to problems through the application of engineering knowledge and understanding 2. The skills of selecting and applying scientific principles in the modelling and analysis of aero processes and the inter-relations between systems processes and products. 3. The ability to use a broad spectrum of technologies/techniques to solve complex design problems. 4. The capability to use scientific/technological principles in the development of engineering	**Teaching/learning methods and strategies:** At all levels students are required to bring together knowledge and skills acquired in several modules and hence determine new ways of working. As the student progresses, the need to synthesise ever greater volumes of information and approaches into a coherent approach is developed and consequently so is their critical thinking. At level 1 analysis, evaluation and problem solving are developed on small-scale problems in various programming activities in a number of modules. Here the focus is on understanding the problem and then solving it free from the environmental implications of real world problems and without the need to examine alternatives and to balance conflicting goals.

Part 3: Learning Outcomes of the Programme	
solutions to practical problems in the domain of aerospace engineering. 5. The ability to select and apply appropriate computer based methods for modelling and analysing problems in fields relating to the manufacture components and systems, with particular emphasis on the requirements of the aero industries. 6. The ability to understand issues relating to the marketing of products and the management processes associated with their design and manufacture. 7. A professional attitude to the responsibilities of engineering practitioners. 8. The ability to use independent thinking and analysis in the development of engineering solutions. 9. The capability to critically review available literature on topics related to aerospace engineering 10. The capability to critically evaluate evidence to support conclusions, reviewing its reliability, validity and significance. Also to be able to investigate contradictory information and identify reasons for contradictions. The above skills satisfy the SEEC descriptors for levels 1, 2 and 3.	At level 2 there is a move away from small-scale problems to the design of larger scale systems. With this comes the need to evaluate alternative methods and designs and to balance conflicting objectives. Level 3 sees the move to specific application examples and with it the need to appreciate problem contexts is developed as well as striking the right balance when facing conflicting objectives.. The development of engineering solutions requires demonstration of all of the intellectual skills. At level 1 the focus is on the skills of Analysis, Evaluation and Problem Solving. At levels 2 and 3 this branches out to include all the remaining skills. Independent reading is used to enable students to both broaden and deepen their subject knowledge. **Assessment:** Aerospace engineering work requires demonstration of a very wide range of skills. These skills are assessed through a combination of coursework on cross-disciplinary integrating assignments, integrating projects; and examinations.
C Subject, Professional and Practical Skills	
C Subject, Professional and Practical Skills 1 Students will be able to: 1. Use appropriate methods for modelling and analysing problems especially in their chosen specialisation area (systems, manufacture or design). 2. Use relevant design, test and measurement equipment. 3. Use experimental methods in the laboratory relating to engineering manufacture and test. 4. Demonstrate practical testing of engineering ideas through laboratory work or simulation with technical analysis and critical evaluation of results.	**Teaching/learning methods and strategies:** Throughout the programme, the skills listed are developed through a combination of theoretical discussion, practical laboratory based work, classroom based tutorial exercises and directed self-study. Skills 1-5 are introduced at level 1 and then drawn into sharper focus at levels 2 and 3. The general teaching/learning approach is therefore to impart these practical/professional skills by a process of moving from an overview of what is required to a specific application of an individual skill at a higher level. The more specific skill 6 is introduced at level 3. Skill 7 is developed from level 1 upwards e.g. for individual understanding of lecture material and software, and operating laboratory equipment.

Part 3: Learning Outcomes of the Programme	
5. Use a wide range of computing and information technology systems. 6. Demonstrate the ability to apply engineering techniques taking account of industrial and commercial constraints especially in their chosen aerospace specialism domain of manufacturing, systems or design engineering. 7. Act autonomously, with minimal supervision or direction, within agreed guidelines. 8. Operate in complex and unpredictable contexts, requiring selection and application from a wide range of innovative or standard techniques. 9. Execute and manage multi-disciplinary projects.	Skills 8 through 11 are introduced at level 2 through the Project Management module (UFMFHA-15-2). These skills introduced above level 1 are underpinned by the more generalised capabilities that are practiced throughout the levels in most of the modules that contribute to the award. **Assessment:** The possession of these skills is demonstrated by the development of practical laboratory work, coursework, presentations and examinations. The practical nature of the skills to be acquired means that some are specifically addressed by particular modules, whilst the more generic skills are assessed across a range of modules.
D Transferable Skills and other attributes	
D Transferable Skills and other attributes 1. Communication skills: To communicate orally or in writing, including, for instance, the results of technical investigations, to peers and/or to "problem owners". 2. Self-management skills: To manage one's own time; to take responsibility for the quality of the work; to meet deadlines; to work with others having gained insights into the problems of team-based systems development. 3. IT Skills in Context: To use software in the context of problem-solving investigations, and to interpret findings. 4. Problem formulation: To express problems in appropriate notations. 5. Progression to independent learning: To gain experience of, and to develop skills in, learning independently of structured class work. For example, to develop the ability to use on-line facilities to further self-study. 6. Comprehension of professional literature: To read and to use literature sources appropriate to the discipline to support learning activities. 7. Group Working**:** To be able to work as a member of a team; to be aware of the benefits and problems which teamwork can bring.	Teaching/learning methods and strategies: 1. Skill one is developed through a variety of methods and strategies including the following: • Students maintain laboratory log books • Students participate in workshops and group work presentation sessions. • Students participate in discussion tutorials • Students present research topic findings in tutorials • Students participate in individual tutorials 2. Skill two is developed through a variety of methods and strategies including the following: • Students conduct self-managed practical work • Students participate in practically-oriented tutorial • Students work through practical work-sheets in teams • Students practice design and programming 3. Skill three is developed widely throughout the programme. 4. Skill four is developed through a variety of methods and strategies including the following: • Students develop problem solving programs • Students practice design and programming • Students express problems in mathematical notation. 5. Skill five is developed through a variety of methods and strategies including the following: • Students are encouraged to practice programming to extend their skills • Students develop problem-solving programs

Part 3: Learning Outcomes of the Programme

8. Information Management: To be able to select and manage information, competently undertaking reasonably straight-forward research tasks with minimum guidance.

9. Self-evaluation: To be confident in application of own criteria of judgement and can challenge received opinion and reflect on action. Can seek and make use of feedback.

The above mentioned skills satisfy SEEC descriptors at levels 1, 2 and 3.

- Students are encouraged to research relevant topics
- Students are encouraged to use online facilities to discover information

6. Skill six is developed through a variety of methods and strategies including the following:
   - Students are encouraged to access a range of material including both printed and online sources
   - Students are expected to include a literature review in the Individual Project
7. Skill seven is developed through a variety of methods and strategies including student involvement in group projects in a number of modules across the programme.
8. Skill eight is widely developed and tested through modules of different aerospace topics. It is also integrated strongly into the individual project.
9. Skill 9 is developed across the aerospace topics through a variety of assignments, presentations and vivas. Feedback to students from staff is frequent and specific to the individual.

Assessment:

The skills are demonstrated in a variety of contexts including: examination; poster presentation; individual and group projects; practical assignments; portfolio of exercises. In addition skill two is assessed by both peers and tutors.

In particular, a variety of transferable skills are assessed in modules:
UFMF8C-15-2 Project Management (WBL)
UFMFM7-15-3 Business Environment
UFMFX8-30-3 Individual Project

Part 4: Programme Structure

This section describes the programme as it will be delivered for the apprenticeship from entry through to graduation including:

- level and credit requirements
- interim award requirements
- module diet, including compulsory and optional modules

			Compulsory Modules	Optional Modules	Awards
ENTRY	Year 1 at UCW	Level 1 full-time	UFMFH3-30-1 Stress and Dynamics UFMF7C-30-1 Design, Materials & Manufacturing (WBL)		**Interim award**: CertHe Aerospace Engineering (120 credits)

			UFMFJ9-30-1 Engineering Mathematics		
			UFMFF3-15-1 Energy & Thermodynamics		
			UFMFDH-15-1 Introduction to Aeronautics		
	Year 2 at UCW	**Level 2 full-time**	**From 2019/20 students take:** • UFMFRK-15-2 Fundamental Aerodynamics • UFMFFK-15-2 Flight (Transitional structure: In September 2017/18 and 2018/19 students take UFMFY6-30-2 Aerodynamics and Flight)		**Interim award**: DipHE Aerospace Engineering (Manufacturing) (240 credits)
			UFMFK9-15-2 Engineering Mathematics 2		
			UFMFY6-30-2 Aerodynamics and Flight		
			UFMFD8-30-2 Design, Materials & CAD/CAM		
			UFMF8C-15-2 Project Management (WBL)		
	Year 3.1	**Levels 2 and 3 at UWE**	UFMFX6-15-2 Aero Structures		
			UFMFR9-15-2 Mechatronics		
			UFMFE9-30-3 Structural Inspection and Design		
			UFMFWF-15-3 Managing Advanced Manufacture		
			UFMFM7-15-3 Business Environment		**Interim award: BEng Aerospace Engineering (Manufacturing) (300 credits)**
	Year [illegible]	**Levels 3**	UFMFX8-30-3 Individual Project		

			UFMFC9-15-3 Machine Vision UFMFW6-15-3 Aero Propulsion		**HIGHEST AWARD: BEng(Hons) Aerospace Engineering (Manufacturing)**

End Point Assessment (EPA)

- For the level 6 Aerospace Engineer standard the HEI is not involved in the EPA. The assessment is carried out by the employer and a Professional Engineering Institution.
- The employer undertakes a Portfolio based Occupational Competence Validation Interview (Viva)
- A nominated Professional Engineering Institution (PEI) undertakes the independent assessment to determine if the apprentice has met as a minimum the pass grade criteria for professional competence as specified in the Assessment Plan and aligned to criteria for an Incorporated Engineer (IEng) as defined by the UK-SPEC.
- The PEI will also undertake an independent quality assurance of the Employer Viva Interview documentation and checks that the employer approved mandatory qualifications achieved during the on programme phase and checked at Gateway 2 of the delivery plan have been achieved and certificated.

Part 5: Entry Requirements

- **GCSE:** Mathematics and English Language at grade C or above required.
- **Specific subjects:** A level Mathematics grade C; IB Mathematics (Higher) grade 5; BTEC unit Further Mathematics for Engineering Technicians; or equivalent. Also one of the following: Chemistry, Computing/Computer Science, Design and Technology, Electronics, Engineering, Information and Communications Technology, Music Technology, Physics.
- **Relevant subjects:** Physics, Computing, ICT, Engineering, Science
- **EDEXCEL (BTEC) Diploma:** BTEC Nationals accepted: Aerospace Engineering; Communications Technology; Electrical/Electronic Engineering; Engineering; Manufacturing Engineering; Mechanical Engineering; Operations and Maintenance Engineering; Polymer Processing and Materials Technology; Telecommunications.
- Students with a BTEC National Diploma must have passed Further Mathematics for Engineering Technicians, and those with the 14 – 19 Diploma must also offer the Additional Specialised Learning in Mathematics.
- **Access:** Achievement of the Access to HE Diploma; achievement of Level 3 credits in Mathematics to include algebra and calculus (please contact us for further information and advice); plus at least one other Science or Technology subject; achievement of Level 2 credits in Mathematics, English Language and Science.
- **Baccalaureate IB:** Accepted (see the UCAS website for the UCAS tariff points that you can gain from the IB to put towards our points requirements)
- **An interview may also be required**

For the University's general entry requirements please see http://www.uwe.ac.uk/study/entryReqs.shtml

Mature applicants with relevant experience who do not have the stated entry requirements are encouraged to apply.

Tariff points as appropriate for the year of entry - up to date requirements are available through the courses database

Part 5: Entry Requirements

Part 6: Reference Points and Benchmarks
Set out which reference points and benchmarks have been used in the design of the programme: QAA UK Quality Code for HE -Framework for higher education qualifications (FHEQ) -Subject benchmark statements -Qualification characteristics for Foundation degrees and Master's degrees Strategy 2020 University policies Staff research projects Any relevant PSRB requirements Any occupational standards Apprenticeship Standard Please see appendix 1 for the programme/Apprenticeship Standard mapping

Appendix 1: Mapping of learning outcomes from BEng (Hons) Aerospace Engineering (Manufacturing) to the Aerospace Engineer Apprenticeship Standard

The below table demonstrates how the degree satisfies the knowledge, skills and behaviours defined in the apprenticeship standard. Where the defined outcomes cannot be satisfied by the degree alone, the table states the methods through which the apprentice is expected to achieve them.

Knowledge and Skills		**Assessment method**	**Where covered**	**Degree module code(s)**
Understand engineering process & practices covering:	Mechanical/electrical/electronic systems design	Degree /work-based log book - portfolio	Degree	UFMFW8-30-2
	Design and Stress Analysis (e.g. computer aided engineering techniques)		Degree	UFMFN3-30-1 & UFMFN3-30-1 &
	System design		NVQ	
	Integration and test		Degree	UFMFE9-30-3
	In-service and through product life support		NVQ	
	Advanced manufacturing		Degree	UFMFWF-15-3
	Aerospace quality and governance		NVQ	
Understand the applicable regulatory and quality requirements	As systems and products mature through their development	work-based log book - portfolio	NVQ	
	Qualification and in-service phases		NVQ	
Understand and apply analytical methods – Engineering Mathematics	Algebra, differentiation, function, geometry, trigonometry	Degree	Degree	UFMFJ9-30-1 & UFMFK9-15-2
	Statistics		Delivered by WC to meet requirements	
Understand aeronautical sciences	Stress and strain	Degree	Degree	UFMFH3-30-1 & UFMFQA-15-2
	Static and dynamic systems		Degree	UFMFH3-30-1
	Force, resistance, mass and weight, motion		Degree	UFMFH3-30-1
	Electrical power		Degree	UFMFR9-15-2
Understand material sciences	Selection and application	Degree	Degree	UFMFN3-30-1 & UFMFD8-30-2
	Structures and properties		Degree	UFMFH3-30-1 & UFMFE9-30-3
	Analytical testing		Degree	UFMFE9-30-3
Regulations	Demonstrate the ability to comply with statutory, organisational, environmental, health and safety regulations/	work-based log book - portfolio	NVQ	

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Business improvement techniques	Apply business improvement techniques ensuring optimisation of processes, resources and budgets	Degree / work-based log book - portfolio	Degree NVQ	UFMFM7-15-3

Knowledge and Skills		**Assessment method**	**Where covered**	**Degree module code(s)**
Apply a wide range of technical skill sets applied to a range of aerospace disciplines and contexts →				
	Research	Degree / work-based log book - portfolio	Degree	UFMFX8-30-3
	Development		NVQ	
	Design	Degree / work-based log book - portfolio	Degree	UFMFN3-30-1
	Procurement		NVQ	
	Logistics		NVQ	
	Planning	Degree / work-based log book - portfolio	Degree NVQ	UFMF8C-15-2 UFMFN7-15-3 UFMFX9-30-3
	Production		NVQ	
	Quality Assurance		NVQ	
	Inspection	Degree / work-based log book - portfolio	Degree NVQ	UFMFE9-30-3
	Testing	Degree / work-based log book - portfolio	Degree NVQ	UFMFE9-30-3
	Installation		NVQ	
	Commissioning		NVQ	
	Life cycle management		NVQ	
	Decommissioning		NVQ	
	Environmental Compliance		NVQ	

With respect to the above can the apprentice demonstrate

- Planning what has to be done, when and by whom
- Ensuring that **resources** are available and capable of achieving the required outcomes
- Allocating and deploying **resources** in a timely manner
- Completing/project managing work outputs/programmes to the required specification
- **Monitoring** programmes of work and report progress to appropriate personnel

Appendix 1: Mapping of learning outcomes from BEng (Hons) Aerospace Engineering (Manufacturing) to the Aerospace Engineer Apprenticeship Standard

- Agreeing any amendments to work **specification**/work requirements
- Ensuring that quality assurance requirements are adhered to
- Retaining and storing documentation and records for traceability

Definitions:
Monitoring: The regular checking of specific aerospace engineering activities or outcomes to ensure that they are being achieved according to requirements. Monitoring includes observation; data collection; sampling, and can be continuous; periodic; on demand; random; scheduled; formal; informal.
Resources: The available means to undertake processes and achieve aerospace work outcomes. Resources include equipment; facilities; finance; material; people; information/data, and are obtained from customers; suppliers; or from within their own organisation.
Specifications are precise technical descriptions of the characteristics of an Aerospace engineered product or Aerospace engineered process such as performance, function, quality, materials, aesthetics, life cycle, technologies, performance/capability, delivery schedule, interfacing, environmental/sustainability, branding, safety, budget, volume, timing.

Behaviours	**What is required**	**Assessment method**	**Where covered**	**Degree module code(s)**
Knowledge and understanding	Commitment to continue personal development, refreshing and expanding Engineering knowledge through a variety of methods	Degree / work-based log book - portfolio	Degree NVQ	UFMF8C-15-2 UFMFN7-15-3 UFMFX9-30-3
Design and development pf processes, systems, services and products	Contributing to the continuing development of Engineering within their domain	Degree / work-based log book - portfolio	Degree NVQ	UFMFN7-15-3
Responsibility, management or leadership	Taking personal responsibility for their actions, managing projects, including resource management within their remit	Degree / work-based log book - portfolio	Degree NVQ	UFMF8C-15-2 UFMFN7-15-3
Communication and inter-personal skills	Be able to demonstrate a range of communication styles and methods. Understanding the importance of network within and across functions	Degree / work-based log book - portfolio	Degree NVQ	UFMF8C-15-2 UFMFN7-15-3
Professional commitment	Demonstrating a personal and professional commitment to society, their profession and the environment, adopting a set of values and behaviours that will maintain and enhance the reputation of the profession.	work-based log book - portfolio	NVQ	

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Approval Date	**Special CAP 10 August 2017**			
Revision CAP Approval Date *Update this row each time a change goes to CAP*		Version	**1**	*Link to RIA ??*
Next Periodic Curriculum Review due date	*Academic year in which next Periodic Curriculum Review due (6 years from initial approval or last Periodic Curriculum Review)/?*			
Date of last Periodic Curriculum Review				