University of the West of England
BRISTOL

CORPORATE AND ACADEMIC SERVICES

PROGRAMME SPECIFICATION

Part 1: Basic Data			
Awarding Institution	University of the West of England, Bristol		
Teaching Institution	City of Bristol College University Centre Weston (UCW)		
Delivery Location	City of Bristol College University Centre Weston (UCW)		
Faculty responsible for programme	Faculty of Environment and Technology		
Department responsible for programme	Department of Engineering Design and Mathematics		
Modular Scheme Title			
Professional Statutory or Regulatory Body Links	Royal Aeronautical Society - Accreditation July 2013 for programme delivered at City of Bristol College only		
Highest Award Title	FdSc Aerospace Engineering Manufacturing		
Default Award Title			
Fall-back Award Title			
Interim Award Titles	Certificate of Higher Education Aerospace Engineering Manufacturing		
UWE Progression Route	BEng Aerospace Engineering		
Mode(s) of Delivery	Full Time /Part Time		
Codes	**UCAS:**		**JACS:**
	ISIS2: H40B		**HESA:**
Relevant QAA Subject Benchmark Statements	Engineering		
First CAP Approval Date	*September 2012*	Valid from	*September 2012 v1*
Revision CAP Approval Date	*Version 1.1 Feb 2014* *Version 1.2 Feb 2016* *Version 1.3 March 2016* *Version 2 September 2017*	Valid from	*September 2017*
Version	2		
Review Date			

Part 2: Educational Aims of the Programme

The aim of the programme is to respond to the need for effective engineering practitioners by offering a programme that is an intellectually challenging mix of taught engineering science and experiential learning. The practitioner approach is intended to produce engineers with a strong orientation towards problem solving, underpinned by theoretical knowledge.

This programme will produce apprentices with a broad understanding of Aerospace Engineering, combining sound knowledge of the technological fundamentals of the subject with awareness of engineering practice, information technology, management and marketing issues. Graduates from this programme will be equipped to solve multi-disciplinary problems in the domain of Aerospace Engineering.

The courses will produce apprentices with a wide range of expertise relevant to aerospace design and manufacture. The recruitment from local industries of UWE aerospace graduates over the last 20+ years indicates a solid demand for graduates with a broad-based approach to engineering problem solving and a sound understanding of multi-disciplinary projects. This is particularly evident in the aerospace industry where engineering projects invariably involve multi- disciplinary teams working on long-term design and product development programmes. It is anticipated that the apprentices from the course will play a major role in such projects, whether in the management and co-ordination, or the specification of high-tech manufacturing and design solutions.

The aims are that apprentices shall be able to:

- Apply established and novel engineering concepts to the solution of problems involving the design, operation and manufacture of aircraft;
- Model mechanical 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 judgements 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.

Part 3: Learning Outcomes of the Programme	
The award route provides opportunities for students to develop and demonstrate knowledge and understanding, qualities, skills and other attributes in the following areas:	
Learning Outcomes	**Teaching, Learning and Assessment Strategies**
A Knowledge and Understanding	
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. The above skills meet the SEEC Level Descriptors for level 1and 2 learning outcomes.	**Teaching/learning methods and strategies:** Acquisition of 1 to 6 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. This approach satisfies outcomes 1-5. Outcome 6 is achieved through the business practice modules of UFMF8C-15-2 Project Management (WBL). 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	**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

Part 3: Learning Outcomes of the Programme

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 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 and 2.	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. 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. 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 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	**Teaching/learning methods and strategies:**
Students will be able to: 1. Use appropriate methods for modelling and analysing problems. 2. Use relevant design, test and measurement	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.

Part 3: Learning Outcomes of the Programme

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. 5. Use a wide range of computing and information technology systems. 6. Act autonomously, with minimal supervision or direction, within agreed guidelines. 7. Operate in complex and unpredictable contexts, requiring selection and application from a wide range of innovative or standard techniques. 8. Execute and manage multi-disciplinary projects. The above mentioned skills satisfy SEEC descriptors at levels 1 and 2.	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. Skill 6 is developed from level 1 upwards e.g. for individual understanding of lecture material and software, and operating laboratory equipment. Skills 7 and 8 are introduced at level 2 through the Project Management (WBL) module (UFMF8C-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.	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

Part 3: Learning Outcomes of the Programme

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.

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 and 2.

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
    - 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 module UFMF8C-15-2 Project Management (WBL)

Part 4: Programme Structure
This structure diagram demonstrates the student journey from Entry through to Graduation, including: level and credit requirements, interim award requirements, module diet, including compulsory and optional modules

Full time entry:

ENTRY ↓	level 1	**Compulsory modules – are taken and must be passed by all students** • UFMFH3-30-1 Stress and Dynamics • UFMF7C-30-1 Design, Materials & Manufacturing (WBL) • UFMFJ9-30-1 Engineering Mathematics • UFMFF3-15-1 Energy & Thermodynamics • UFMFDH-15-1 Introduction to Aeronautics	**Interim Awards:** Certificate of Higher Education Aerospace Engineering Credit requirements: 120 credits. Other requirements: a Cert HE has to be requested by the student in writing.
	level 2	**Compulsory modules – are taken and must be passed by all students** **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) • UFMFK9-15-2 Mathematics for Mechanical & Aerospace Engineering • UFMF8C-15-2 Project Management (WBL) • UFMFX6-15-2 Aero-Structures • UFMFD8-30-2 Design, Materials & CAD/CAM • UFMFQA-15-2 Stress Analysis	**Interim Awards:** None **Highest Award:** FdSc Aerospace Engineering Manufacturing Credit requirements: 240 credits.
		• A student may transfer to the BSc Engineering degree if unable to progress through the FdSc course as long as they successfully complete the level 1 modules. • All of the CoBC students are employed on an apprenticeship programme with either Rolls Royce or Airbus. Should they be unsuccessful in year two, they will not be able to transfer to the BSc Engineering Degree and remain within their Apprenticeship frame work. They will be able to transfer if they wish to continue with individual private study.	

→ **GRADUATION**

Achievement of FdSc is normally followed by progression into Level 3 of Aerospace Engineering (Design Pathway)

Part time route:

ENTRY ↓	**Year 1.1**	**Compulsory modules – are taken and must be passed by all students** • UFMF7C-30-1 Design, Materials & Manufacturing (WBL) • UFMFJ9-30-1 Engineering Mathematics	**Interim Awards:** None
	Year 1.2	**Compulsory modules – are taken and must be passed by all students** • UFMFH3-30-1 Stress and Dynamics • UFMFF3-15-1 Energy & Thermodynamics • UFMFDH-15-1 Introduction to Aeronautics	**Interim Awards:** Certificate of Higher Education Aerospace Engineering Credit requirements: 120 credits. Other requirements: a Cert HE has to be requested by the student in writing.
	Year 2.1	**Compulsory modules – are taken and must be passed by all students** **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) • UFMFK9-15-2 Mathematics for Mechanical & Aerospace Engineering • UFMF8C-15-2 Project Management (WBL)	**Interim Awards:** None

	Year 2.2	**Compulsory modules – are taken and must be passed by all students** • UFMFX6-15-2 Aero-Structures • UFMFD8-30-2 Design, Materials & CAD/CAM • UFMFQA-15-2 Stress Analysis	**Interim Awards:** None **Highest Award:** FdSc Aerospace Engineering Manufacturing Credit requirements: 240 credits.

→ **GRADUATION**

Achievement of FdSc is normally followed by progression into Level 3 of Aerospace Engineering (Design Pathway)

At Weston College the delivery pattern will be as follows:

Full time route:

ENTRY ↓	Year 1	**Compulsory modules – are taken and must be passed by all students** UFMFH3-30-1 Stress and Dynamics UFMFJ9-30-1 Engineering Mathematics UFMF7C-30-1 Design, Materials and Manufacturing (Work Based Learning) UFMFF3-15-1 Energy and Thermodynamics UFMFDH-15-1 Introduction to Aeronautics	Interim awards: Interim Awards: Certificate of Higher Education Aerospace Engineering Credit requirements: 120 credits. Other requirements: a Cert HE has to be requested by the student in writing.

	Year 2	**Compulsory modules – are taken and must be passed by all students** UFMFK9-15-2 Engineering Mathematics 2 UFMFQA-15-2 Stress analysis 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) UFMFD8-30-2 Design, Materials and CAD/CAM UFMF8C-15-2 Project Management (Work Based Learning) UFMFX6-15-2 Aero Structures	Interim Awards: None Highest Award: FdSc Aerospace Engineering Manufacturing Credit requirements: 240 credits.

Weston College Part time route:

ENTRY ↓	**Year 1**	**Compulsory modules – are taken and must be passed by all students** UFMFH3-30-1 Stress and Dynamics UFMFJ9-30-1 Engineering Mathematics UFMF7C-30-1 Design, Materials and Manufacturing (Work Based Learning)	**Interim awards:** None

	Year 2	**Compulsory modules – are taken and must be passed by all students** UFMFF3-15-1 Energy and Thermodynamics UFMFDH-15-1 Introduction to Aeronautics UFMFK9-15-2 Engineering Mathematics 2 UFMFQA-15-2 Stress analysis	**Interim Awards:** Certificate of Higher Education Aerospace Engineering Credit requirements: 120 credits. Other requirements: a Cert HE has to be requested by the student in writing.
	Year 3	**Compulsory modules – are taken and must be passed by all students** 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) UFMFD8-30-2 Design, Materials and CAD/CAM UFMF8C-15-2 Project Management (Work Based Learning) UFMFX6-15-2 Aero Structures	**Interim Awards:** None **Highest Award:** FdSc Aerospace Engineering Manufacturing Credit requirements: 240 credits.

Part 5: Entry Requirements

The university's minimum requirements for entry to a degree apply to this programme.

In addition the tariff point requirement is normally 300 points. This should include the equivalent of A level Mathematics Grade C plus another science or technology subject. Equivalent qualifications include Scottish Highers, the European Baccalaureate, the International Baccalaureate; and other European and international qualifications which are nationally recognised.

Students with a BTEC National Diploma must have passed Further Mathematics, and those with the 14 – 19 Diploma must also offer the Additional Specialised Learning in Mathematics.

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

Part 6: Assessment

The programme will adhere to the standard assessment regulations of the University as specified in the Academic Regulations and Procedures (http://acreg.uwe.ac.ukrf.asp).

		Unseen Written Exam	Partly Seen Written Exam	Computer Based Exam	Lab based Assessment	Written Assignment	Computer based tests	In class Written Tests	Essay	Report / Project	Dissertation	Oral Presentation
Compulsory Modules Level 1	**UFMFJ9-30-1**	A (75)				B (12.5)	B(12.5)					
	UFMF7C-30-1	A (25)					B (30)			B(45)		
	UFMFH3-30-1	A(40), B(40)					A(10), B (10)					
	UFMFF3-15-1	A (100)										
	UFMFDH-15-1	A (75)					B (25)					
Compulsory Modules Level 2	**UFMFRK-15-2**	A(50)				B(50)						
	UFMFFK-15-2	A(50)				B(50)						
	Transitional structure: In September 2017/18 and 2018/19 students take UFMFY6-30-2 instead of UFMFRK-15-2 and UFMFFK-15-2	A(40)				B(60)						
	UFMFX6-15-2	A (75)			B(25)							
	UFMFK9-15-2	A(75)					B(25)					
	UFMF8C-15-2									A(100)		
	UFMFD8-30-2	A(25)								B(75)		
	UFMFQA-15-2	A(67.5)					A (7.5)			B(25)		

*Assessment should be shown in terms of either Written Exams, Practical exams, or Coursework as indicated by the colour coding above.

Part 7: Student Learning

Teaching, learning and assessment strategies to enable learning outcomes to be achieved and demonstrated

Class Activities

The mode of delivery of a module is determined by its Module Leader, and typically involves a combination of one or more lectures, tutorials, laboratory classes, group activities and individual project work.

Academic Support

Part 7: Student Learning

Academic advice and support is the responsibility of the staff delivering the module in question. Staff are expected to be available outside normal timetabled hours, either by appointment or during published "surgery" hours, in order to offer advice and guidance on matters relating to the material being taught and on its assessment.

Mathematics Support
Additional support in mathematics outside of timetabled classes is available throughout the academic year via:
(i) the Mathematics Resource Centre which is accessible by students using their swipe card and has take-away leaflets, text books, module handbooks and reference material
(ii) on-line support and electronic learning resources such as that Maths 1st Aid Kit leaflets, HELM booklets and http://www.mathcentre.ac.uk/
(iii) Mathematical software such as Maple (which students may download for home use) and Matlab.
(iv) First year aerospace students also use e-assessment in their mathematical modules in the form of computerised tests via the commercial QuestionMark and in-house DEWIS system respectively. Coursework consists of a series of online tests which students may take several times. Instant detailed feedback is provided, particularly for the DEWIS system, which supports the students' learning.

Technology Enhanced Learning
All modules on the aerospace programme are available on the university's Virtual Learning Environment "Blackboard" through UWEOnline. Additionally:

- computer based e-assessment is implemented in a number of modules, so that students can take regular short tests with automated computer generated feedback.
- Recordings of some lectures (audio and video) are made available after classes via the university's Virtual Learning Environment and YouTube
- Weston College will transfer materials to its Moodle platform which will comply with Weston College HE VLE Standards.

Working Environment
Throughout the department there are areas for students to work together informally. A large, well-equipped project room is also provided during the weekdays with staff support. The Project room houses printing, computing, binding and scanning facilities, sells stationery, stocks learning materials, past dissertations, and contains the coursework hand-in desk.

Currently students studying at CoBC have access to quiet study areas, IT suites and any of the colleges seven Learning Resource centres (LRC). In addition they also have access to UWE's LRC and its project and study rooms. During the summer of 2013 the CoBC school of Aeronautical Engineering will be moving to a new site at Parkway. The LRC at this is a completely new build and will have study/project rooms available to the students.
Students working at Weston College have access to bespoke engineering labortaories in the Locking Road, South West Skills Campus. Quiet working space and HE library facilities are available both at the Locking Road campus and also at Knighstone.

Progression to Independent Study
Many modules require students to carry out independent study, such as research for projects and assignments, and a full range of facilities are available to help students with these. The philosophy is accordingly to offer students both guided support and opportunities for independent study. Guided support, mainly in the form of timetabled sessions, takes the form of lectures, tutorials, seminars and practical laboratory sessions. Students are expected to attend all sessions on their timetable, and this is especially important because of the high content of practical work in the programme. The progression to independent study is also assisted by the nature of the support offered in individual modules. Typically, module leaders will provide a plan for the module indicating the activities to be carried out and the forms of learning to be undertaken during the delivery of the module, with a view to encouraging students to plan ahead and to take responsibility for managing their time and resources.

Part 7: Student Learning

Engineering Facilities
Students can access a suite of newly refurbished specialist laboratories at UWE for teaching demonstrations and supporting student projects. These facilities have been subject to a recent and ongoing investment of £1.6 million All equipment is maintained as appropriate. Hazardous machinery and items of equipment undergo monthly checks. PCs with data acquisition hardware (and software for general experimental use) are set up next to all experimental rigs where data logging is required.

In the Thermofluids laboratory there are a number of bench-top test rigs and flow benches used in the teaching of heat transfer and fluid flow fundamentals, and a substantial pump/turbine unit. Facilities also include a subsonic wind tunnel with two working sections (low-speed 3.66m by 3.05m, high speed 2.14m by 1.53m). The tunnel has a 6-axis load cell for measurements, a real time data acquisition system, and a hydraulically actuated system for dynamically testing pitching wings. The supersonic wind tunnel can produce flow up to M1.8 and has a working section of 152 by 25mm. Also situated in the Thermofluids Laboratory is a Merlin MP521 Engineering Flight Simulator which has a wide-bodied capsule mounted on a full six axis hydraulic motion system with a full width instrument panel and a real-time visual scene. The flight software enables students to program in their own aircraft designs for testing. The simulator provides a valuable link between theory and practice for students of mechanics of flight and aerodynamics. Other equipment includes a water flume; and various model aircraft, both fixed wing and helicopter.

There are a number of engine test-cells used for undergraduate laboratory sessions. One large engine test cell houses a Techquipment GT100S gas turbine demonstrator and a motorcycle rolling-road dynamometer complete with department Triumph motorcycle. The GT100s unit is a small gas turbine engine of the turbo-jet type which is extensively instrumented enabling measurement of component and overall efficiencies and other operating parameters. The rolling road & motorcycle is particularly useful in the teaching of the principles and operation of Engine Control Units and the effects of altering fuel and ignition mappings. A suite of two smaller test cells and a control room houses a Rover K series petrol engine, a test bed for the piston engine and the larger more flexible engine test bed is currently equipped with a 500bhp load absorber and is controlled by current industrial technology in the form of a DSG DaTaq Pro control system.

The Structures Laboratory is equipped with a range of tensile/compressive test machines, appropriate load cells and general test accessories to cover static and dynamic testing at forces ranging from 50 N up to 250 kN There is a universal testing machine with 10kN and 50kN load cells; a bench-top 25kN tensile test machine; and a bench-top test machine with 50N, 500N and 5kN load cells. Three dynamic servo-hydraulic fatigue test machines are available with 250kN, 100kN and 10kN load cells, plus an electromagnetic resonance fatigue tester with 100kN and 20kN load cells. Other facilities used for experimental stress analysis work includes a strong floor and strong wall; hydraulic actuators; strain scanners and indicators; two transmission and two reflection polariscopes. A comprehensive range of gauge application equipment and gauges is maintained for the manufacture of in-house load cells for both single and multi-axis applications. A composite manufacturing cell is available to the students for the production of composite specimens and components.

The Materials laboratory contains bench-top tensile test machines and impact/hardness testers; furnaces for heat treatment & casting; metallography preparation equipment and microscopes; and non-destructive testing equipment. A scanning electron microscope is also available for use on students' individual projects. An Annual subscription to the Cambridge Engineering Selector (CES) eduPack enables us to integrate computer-based materials selection & computer based manufacturing processes selection with our design modules.

The Dynamics laboratory comprises a suite of rooms (including one that is temperature controlled). Apparatus includes several electromagnetic shakers, extensive vibration and sound monitoring equipment & several servo hydraulically actuated apparatus including a miniature Stewart platform. Example applications include aircraft noise measurement and the performance of anti-vibration mounts used for certain aircraft electronic systems.

Part 7: Student Learning

A machine tool workshop is available, equipped with milling machines, lathes, grinders, a welding bay (and welding cabinet for exotic materials such as titanium), rapid prototyping, CNC routers and spray booths. Two vertical machining centres are provided for advanced manufacture.

CoBC students will have controlled access to the UWE labs that are relevant to the programme. There are also additional Engineering and Material Science laboratory facilities at the Ashley Down and Orpen Park college sites.

Computing Facilities
The Department offers specialised computing facilities alongside the general University and Faculty provisions. The specialist laboratories are equipped with specific software to support the Department's students in their taught programmes. Simulation and planning software are well catered for with industry-standard computer-aided design, computational fluid dynamics, finite element analysis, meshing, material and processes selection packages, and post-processing software. There is an extensive PC network including laboratories with high performance workstations and high resolution graphics. A 24-core 204GB memory high performance cluster is available for large-scale computing. Mathematical based software such as Matlab, Simulink, and Maple, and a mathematics resource room are available. The Faculty ensures during term-time that the computer laboratories in N-block are available to students on extended opening hours including at weekends. The Faculty provides a user support Helpdesk. The Helpdesk provides first line support to the user base, uniquely supported by both permanent staff and students (employed on a part time basis) every week-day.

At CoBC the students have extensive access to the college personal and laptop computers. The mandatory computer programmes MATLAB and Solidworks Design are available at our Ashley Down and Orpen Park sites. There is also full support through our LRC and Blackboard computer based systems. These can be accessed by the students at any time.
Weston College students also have access to College desk top and laptop computers at all sites.

Pastoral Care.
The Faculty offers pastoral care through its Student Advisers, a team of staff who provide comprehensive, full-time student support service on a drop-in basis or by appointment. The Adviser will, when necessary, advise the student to seek advice from other professional services including the University's Centre for Student Affairs or from members of academic staff. This support is supplemented by the GDP tutor, who fills the traditional role of Year Tutor, the Programme Director and, through the student representatives to the Student-Staff Liaison Group committee.

All students have direct access to their subject tutors either in person or via email/telephone. In addition, they also have a group tutor who is independent of the programme who the students can seek advice from about any aspect of the course or student life. The college provides full independent welfare and study support which is available 'drop-in' at any one of our seven sites across Bristol or electronically through Blackboard and email.

Weston College provides student support through its HEART (Higher Education Academic Registry Team. Specialist support staff are available at Knighstone and at the SWSC campus.

Additional Features
For the aerospace students, the Induction programme includes team building exercises, and also some specific academic and facility instruction for direct entrants (e.g. in computer packages).

Visits which are incorporated into modules to see facilities include those to Airbus Filton (A340/A380 landing gear, fuel systems, windtunnel facilities), GKN (composite manufacture), Rolls-Royce Filton, BAMC Cardiff (aircraft systems and familiarisation), Flight Safety International Farnborough (flight simulation), RAF Lyneham (Hercules flight simulator) and the Royal Naval Air Station. Visits to the Fleet Air Arm Museum in Yeovilton and the Science Museum London are also organised by staff.

The students that attend CoBC are Rolls Royce and Airbus Apprentices on an apprenticeship

Part 7: Student Learning

programme. During their time at CoBC they have direct access to our five of our six aircraft located at Orpen Park and a visit to the sixth aircraft at Kemble Airport. As the students are in full time employment additional enrichments are not easily achievable

Similarly the students that attend Weston Collge in part time mode are, normally, GKN apprentices and will have acess to the facilities of GKN. As the students are also employed, additional enrichments are not easily achievable.Wherever possible equivalent experience will be facilited.

Part 8: Reference Points and Benchmarks

Description of ***how*** the following reference points and benchmarks have been used in the design of the programme:

The reference points from the QAA academic infrastructure reports and other benchmarks are detailed in Part 1: Contextual Documentation for Validation. They include The QAA Framework for Higher Education Qualifications in England, Wales and Northern Ireland (2008) and the QAA Subject Benchmark Statement for Engineering (2010)

Subject reference points
Undergraduate engineering programmes must demonstrate through their teaching and assessment methods that graduates have reached the desired threshold level of each of the Output Criteria as specified in the UK-SPEC document Accreditation of Higher Education Programmes (www.engc.org.uk/ecukdocuments/internet/document%20library/UK-SPEC.pdf).
The UWE aerospace programme, including each subject pathway, is constructed to ensure it complies with the General and Specific Learning Outcomes, Methods of Assessment (EAB/ACC2/B) and Output Standards (EAB/ACC2/C).

The guidelines for the SEEC level descriptors are also closely followed in this programme. (SEEC Credit Level Descriptors for Further and Higher Education, January 2003)

UWE's Learning & Teaching Strategy has informed the Faculty's policy for the delivery of its programmes, whose main features are described in section 7.

The programme is also aligned with the requirements of the Royal Aeronautical Society and other professional engineering organisations that offer accreditation.

This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical 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 of individual modules can be found in module specifications, available on the University's website.

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