Faculty of
Computing, Engineering
and Mathematical Sciences

Faculty of Computing, Engineering & Mathematical Sciences

M.Eng/B.Eng (Hons) Aerospace Systems Engineerng

October 2004

Programme Specification

Section 1: Basic Data

Awarding institution/body	University of the West of England
Teaching institution	University of the West of England
Faculty responsible for programme	Computing, Engineering and Mathematical Sciences
Programme accredited by	B.Eng by IEE
Highest award title	M.Eng/BEng (Hons) Aerospace Systems Engineering
Default award title	
Interim award title	Diploma of Higher Education, Certificate of Higher Education
Modular Scheme title (if different)	
UCAS code (or other coding system if relevant)	H431/H430
Relevant QAA subject benchmarking group(s)	Engineering
On-going	
Valid from (insert date if appropriate)	

Authorised by… **Date:…**

Version Code 1

For coding purposes, a numerical sequence (1, 2, 3 etc.) should be used for successive programme specifications where 2 replaces 1, and where there are no concurrent specifications. A sequential decimal numbering (1.1; 1.2, 2.1; 2.2 etc) should be used where there are different and concurrent programme specifications

Section 2: Educational Aims of the Programme

The aims of the programme are:

The aim of the Faculty's B.Eng/MEng programmes is to respond to the need for effective engineering practitioners by offering programmes that are 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.

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

The Aerospace Systems Engineering courses will produce graduates with a wide range of expertise relevant to both aerospace design and manufacture. The programme covers a broad range of disciplines such as aircraft design, principles of flight, aerospace manufacture, project management and avionics. Evidence from local industries indicates a solid demand for graduates with a broad-based '*systems*' approach to engineering problem solving. 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 graduates from the course will play a major role in the management and co-ordination of such projects.

The aims are that graduates shall be able to:

1. Apply established and novel engineering analysis concepts to the solution of problems involving the design, operation and manufacture of aircraft;
2. use systems incorporating digital hardware, software, communication, processing algorithms, interfacing circuits and parameter sensing and actuating devices;
3. model mechanical engineering systems so as to be able to specify and assess the technical design;
4. understand the manufacturing, financial and marketing implications of design proposals;
5. identify the links between design, manufacturing and production management and assess the capabilities of manufacturing systems software packages which are used for the design, modification, maintenance and control of manufacturing facilities in aero industries;
6. operate effectively either as individuals or as members of a multi-disciplinary team;
7. communicate effectively both orally and in written form;
8. make considered judgements and decisions on complex engineering issues in which not all facts and consequences are accurately known;
9. effectively pursue independent study and undertake enquiry into novel and unfamiliar concepts and implementations.

Section 3: Learning Outcomes of the Programme

The award route provides opportunities for students to develop and demonstrate knowledge and understanding, intellectual skills, subject-specific skills and transferable skills. as shown below.

A. Knowledge and Understanding

Knowledge and Understanding of:	*Teaching/Learning Methods and Strategies*	*Assessment*
1 The principles governing the behaviour of mechanical 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** A sound understanding of 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. **7** The complexity of large-scale engineering systems and projects, with particular emphasis upon aerospace systems.	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 modules at level 2, and integrated through group design and project work at levels 3 and M. Advanced tools and technologies are studied in the final years of the programmes, and the programme as a whole is integrated through the B.Eng individual project at level 3 or M.Eng individual project at level M. 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. Students on the M.Eng programme are required to demonstrate in-depth understanding and analysis of technical topics, and to carry out a comprehensive literature review in their group design and individual project work.	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	*Teaching/Learning Methods and Strategies*	*Assessment*
1 The ability to produce solutions to problems through the application of engineering knowledge and understanding. **2** Be able to use scientific principles in the modelling and analysis of aero engineering systems, processes and products. **3** The ability to select and apply appropriate mathematical methods for modelling and analysing relevant problems. **4** The ability to use a broad spectrum of technologies/techniques to solve complex engineering problems. **5** Be able to use scientific/technological principles in the development of engineering solutions to practical problems in the domain of aerospace engineering. **6** The ability to select and apply appropriate computer based methods for modelling and analysing problems in fields relating to the design, manufacture and control of aero/mechanical components and systems. **7** The ability to understand issues relating to the marketing of products and the management processes associated with their design and manufacture. **8** A professional attitude to the responsibilities of engineering practitioners. **9** The ability to use independent thinking and analysis in the development of engineering solutions. **10** Critically review available literature on topics related to aero engineering	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. 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. Work at level M focuses on skills 8 and 9, and requires independent thinking, information gathering and analysis. This is delivered through a combination of specialist taught modules plus group and individual project work.	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, 3 and M this branches out to include all the remaining skills. Independent reading is used to enable students to focus on their own areas of interest and in the process ass's skills in submitted reports, assignments and exam answers. Aerospace engineering work requires demonstration of a very wide range of skills (1 - 7). These skills are assessed through a combination of coursework assessments, projects and examinations.

C. Subject, Professional and Practical Skills

Subject/Professional/Practical Skills	*Teaching/Learning Methods and Strategies*	*Assessment*
Students will be able to: **1** Use appropriate mathematical methods for modelling and analysing problems, particularly in aerospace systems. **2** Use relevant design, test and measurement equipment. **3** Use experimental methods in the laboratory relating to engineering design, 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** Demonstrate the ability to apply engineering techniques taking account of industrial and commercial constraints in the domain of aerospace engineering. **7** Execution and management of multi-disciplinary projects.	Throughout the program, the skills listed are developed through a combination of theoretical discussion, practical laboratory based work, classroom based tutorial exercises and directed self-study. Many of the skills listed are introduced at level 1 and then drawn into sharper focus at levels 2 and 3. The general teaching/learning method 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. Some very specific skills are introduced at level 3. These are underpinned by the more generalised capabilities that are practised throughout the levels in most of the modules that contribute to the award.	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

Transferable Skills and Other Attributes	*Teaching/Learning Methods and Strategies*	*Assessment*
1. Communication skills**:** to communicate orally or in writing, including, for instance, the results of technical investigations, to peers and/or to "problem owners".	Skill one is developed through a variety of methods and strategies including the following: ♦ Students maintain laboratory log books ♦ Students participate in electronic conferences, workshops, and group work sessions. ♦ Students participate in discussion tutorials ♦ Students present research topic findings in tutorials ♦ Students participate in individual tutorials	These 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.
2. Self-management skills: to manage one's own time; to meet deadlines; to work with others having gained insights into the problems of team-based systems development.	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 laboratory sessions ♦ Students work through practical work-sheets in teams ♦ Students practice design and programming	
3. IT Skills in Context (to use software in the context of problem-solving investigations, and to interpret findings)	Skill three is developed widely throughout the programme.	
4. Problem formulation: To express problems in appropriate notations.	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 sketch designs of larger systems	

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.	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. Comprehension of professional literature: to read and to use literature sources appropriate to the discipline to support learning activities.	Skill six is developed through a variety of methods and strategies including the following: ♦ Students are encouraged to access online material	
7. Working with Others**:** to be able to work as a member of a team; to be aware of the benefits and problems which teamwork can bring.	Skill seven is developed through a variety of methods and strategies including the following: ♦ Students develop a database system in laboratory sessions	

Section 4: Programme Structure

Note: This structure is indicative and subject to change

Programme Structure for **M/Beng Aerospace Systems Engineering**

MEng Year 4

Meng Individual Project	Avionics Systems Engineering	40 credits
UFEE6V-60-M	UFEE5Y-20-2	Option 3

MEng Year 3

Meng Group Project	Lightweight Structures	Aero-Propulsion	Applied Aeronautics	Aerospace Materials	40 credits
UFPED7-30-M	UFMEBX-10-3	UFMEBC-10-3	UFMEBW-20-3	UFPECK-10-3	Option 2

BEng Year 3

Lightweight Structures	Avionics Systems Engineering	Aero-Propulsion	Applied Aeronautics	Individual Project (Manufacturing)	Aerospace Materials	20 credits
UFMEBX-10-3	UFEE5Y-20-3	UFMEBC-10-3	UFMEBW-20-3	UFPEC7-30-3	UFPECK-10-3	Option 1

Year 2 P (Industrial Placement Year)

M/BEng Year 2

Fundamental Aeronautics	CAD/CAM Applications	Materials & Manufacture	Operations & Quality Management	20 credits
UFMEBV-30-2	UFPEDC-20-2	UFPEDY-30-2	UFPEEL-20-3	Option 1

M/BEng Year 1

Electrical Interface	Mechanical Engineering Principles	Aerospace and Engineering Design 1	Materials and Manufacturing Processes	Engineering Mathematics 1
UFEE6U-10-1	UFMEBF-40-1	UFPEDA-30-1	UFPEDB-20-1	UFQEFH-20-1

Option 1 taken from	
ILP	Modern Language
UFEE6D-10-3	Project Management
UFPECG-10-3	Inspection and Test

Option 2 taken from	
ILP	Modern Language
UFEE6D-10-3	Project Management
UFMEAK-10-3	Finite Element Analysis
UFMEAT-20-3	Mechanics of Materials
UFMEAW-20-3	Dynamics, Noise, Vibration
UFPECG-10-3	Inspection and Test

Option 3 taken from	
Option 2	Not already chosen
UFPEE9-15-M	Computer Vision and Virtual Environments
UFPEEA-15-M	Electromechanical Systems Integration
UFPEEC-15-M	Concurrent Engineering

PLEASE NOTE: REFER TO THE FACULTY ON-LINE INFORMATION SYSTEM FOR UP-TO-DATE STRUCTURE INFORMATION

http://www.cems.uwe.ac.uk/exist/index.xql

Section 5: Entry Requirements

The university's minimum requirements for entry to a degree apply to this programme. In addition entrants are required to have evidence of achievement in Mathematics at GCSE Grade C or equivalent. *Plus any additional award-specific requirements.*

Section 6: Assessment Regulations

The Modular Assessment Regulations apply to this programme

Section 7: Student Learning: Distinctive Features and Support

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, 'lectorials', laboratory classes, group activities and individual project work. Modules on the Foundation Programme which require laboratory classes are commonly delivered by means of a combination of lecture and practicals or tutorials. Other modules are often delivered by means of 'lectorials', classes for groups of 20-30 students with no distinction between lectures and tutorials, and this has proved to be an effective mechanism for modules at Level 0 and 1.

Academic Support 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.

Pastoral Care. The faculty's 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. All students on the same route are allocated to the same Adviser, who is trained to provide advice on matters commonly of concern, including regulatory and other matters; the Adviser will, when necessary, advise the student to seek advice to from other professional services including the university's Centre for Student Affairs or from members of academic staff.

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 at all sites 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 will also be 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.

Computing Facilities The Faculty offers a specialised computing facility along side the general University provisions. There are nine general PC computing laboratories of 20 plus seats all running Windows2000, along with four Unix based laboratory and 10 specialist computing labs. The specialist laboratories are equipped with the specific software for CEMS students; including Software Design Tools development environment, CAD, finite element analysis, mathematics and statistics packages to support the taught program. The specialist Computing laboratories are designed to target the discipline taught in that area. Amongst these, is the Computer Systems Architecture and Linux laboratory? The Unix labs offer the latest web development and programming tools.

One of the most popular areas within the Faculty is the Open Access laboratory. This area is never time-tabled and gives students the opportunity to access machines at all times during opening hours. This is a mixed environment consisting of PCs and Unix workstations.

Due to the extensive computing facility provided within the Faculty, and the specialist nature of this facility, the need for user support is necessary. The Faculty provides a user support Helpdesk. The Helpdesk provides fist line support to the user base, uniquely supported by both permanent staff and students that are in their second or final year of study (employed on a part time basis) until 20.00hrs every day. These general purpose and specialist laboratories are available to students up until midnight, seven days per week.

Section 8 Reference Points/Benchmarks

This programme has been prepared with reference to a number of external benchmarks, including the QAA Subject Benchmark Statement for Engineering, the QAA Framework for HE Qualifications, the university's Learning & Teaching Strategy, and a number of more specialised publication relating to motorsport education as referenced below.

The Subject Benchmark Statement for Engineering outlines a set of skills expected of a graduate in an engineering discipline (Section 4 of the Statement refers), while noting that they should be interpreted in the context of the particular engineering discipline which is being studied. These skills map closely to the skills contained in the learning outcomes for this programme, and hence we have confidence that the programme is in accordance with the precepts of the Statement.

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