University of the West of England
BRISTOL

Faculty of Environment and Technology
Bristol Institute of Technology

MEng Motorsport Engineering

June 2008

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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	**Faculty of Environment and Technology**
Programme accredited by	N/A
Highest award title	MEng Motorsport Engineering
Default award title	
Interim award title	BEng (Hons) Motorsport Engineering BEng Motorsport Engineering Diploma of Higher Education, Certificate of Higher Education
Modular Scheme title (if different)	
UCAS code (or other coding system if relevant)	H334
Relevant QAA subject benchmarking group(s)	Engineering
On-going/valid until* (*delete as appropriate/insert end date)	
Valid from (insert date if appropriate)	1st September 2008

Authorised by… **Date:…**

Version Code

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 aim of the Faculty's 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 the Motorsport Engineering programme is to produce graduates with a broad understanding of mechanical analysis and design, combined with awareness of engineering practice, information technology, project management and business issues, all contextualised to the Motorsport environment. Graduates with MEng will be equipped to solve multi-disciplinary problems and lead future developments in industry. It is anticipated that graduates from the course will play a major role in the design, management and co-ordination of multi-disciplinary projects.

The aims of the programme are:

1. To prepare students for careers in motorsport engineering and related disciplines. The content of the programme should ensure that students would have the appropriate level of knowledge and understanding of mechanical engineering so that they would also be suitable for employment in the wider engineering domain and not be restricted only to the Motorsport environment.

2. To provide insight into, and practical skills in, the creation of complex engineering products, particularly in relation to motorsport. This involves understanding the opportunities provided by vehicle power trains, chassis configurations, various materials and aerodynamics; all considered within the constraints imposed by the relevant regulations. In addition, issues relating to efficient and effective use of resources within the power train and the reduction of environmental impact will be explored.

3. To give the students an understanding of the importance of solving complex ill-defined problems in engineering, and to develop problem-solving and other transferable skills that will be valuable to them in any career.

4. To prepare students for progression to study for higher degrees in appropriate mechanical engineering subjects.

5. To continue the development of those general study skills that will enable students to become independent, lifelong learners.

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. Mechanical Engineering principles and design. 2. Generic engineering topics, plus additional specialist subjects relating to motorsport (such as vehicle dynamics, aerodynamics and power train systems). 3. Structures, materials and safety. 4. Integration of mechanical and non-mechanical elements in complex engineering systems. 5. Business issues relating to engineering products.	The programme of study is designed to introduce the knowledge and understanding necessary to engage, from the beginning, in appreciating and solving small-scale problems. At level 1, the context in which these issues reside is introduced by a set of modules encapsulating the basic principles of mechanical engineering and its related disciplines. More in-depth knowledge and specific understanding of all topics follows in subsequent levels, as students build upon these general principles and develop more specialist knowledge relating to the solution of real-world problems. Thus item 1 underpins items 2 and 3. Item 4 will be primarily taught through modules UFEE6U-10-1 and UFMEDH-20-2, though these concepts will be used in other parts of the programme. A further opportunity is offered via UFMEEA-15-M, which is an option at level M Item 5 will be taught through two specific modules, UFPENX-20-2 and UFPEEL-20-3, where students will research and report upon management and business issues relating to both engineering organisations in general, and to specific motorsport operations. Teaching will be via lectures, tutorials and laboratory sessions. Additionally, students will undertake directed learning through research projects. Students will have opportunity to work both singly and in teams. On all modules, at all levels, students are encouraged to undertake independent reading both to supplement and consolidate what is being taught/learnt and to broaden their individual knowledge of the subject.	Since the first three items are intimately linked, a number of different assessments will relate to them. Item 1 will be assessed through several modules; in year 1 the majority of modules will contribute to this topic, and it will be taken to a higher level in year 2. This material will be assessed via assignments, mini projects, practical laboratory work, in-class tests and examinations. Both items 2 and 3 build on the basic principles expressed in item 1, and are assessed through examination, assignment, project and practical work. There is a particular focus on these items in the final year, although elements are integrated into other modules earlier in the programme. Item 4 will be assessed through assignments, examinations, group presentations and individual project work. Item 5 will be assessed through both individual and group project work (for example in UFPENX-20-2 and UFPEEL-20-3).

B. Intellectual Skills

Intellectual Skills	*Teaching/Learning Methods and Strategies*	*Assessment*
1. Problem Solving 2. Synthesis of different types of information 3. Analysis of requirements, technical situations or engineering solutions 4. Balancing of conflicting objectives 5. Evaluation of opportunities and potential solutions 6. Appreciation of problem contexts 7. Critical Thinking	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 (2) ever-greater volumes of information and approaches into a coherent approach is developed and consequently so is their critical thinking (7). At level 1 Analysis (3), Evaluation (5) and Problem Solving (1) are developed on small-scale problems in various engineering 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 (5) alternative solutions and designs and to balance conflicting objectives (4). Level 3 sees the move to specific application examples and with it the need to appreciate problem contexts (6) is developed as well as striking the right balance when facing conflicting objectives (4). Level M builds on the skills developed in earlier years, but with a stronger emphasis on critical thinking (7), evaluation of alternatives (5) and synthesis of information (2). Individual and group projects are important in the development and integration of these skills.	Engineering of complex products requires demonstration of all the intellectual skills. At level 1 the focus in engineering coursework assessment, undertaken in a number of modules, is on the skills of Analysis (3), Evaluation (5) and Problem Solving (1). At levels 2 and 3 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 assess skills 5-7 in the submitted reports, essays and exam answers. Engineering design work is used to demonstrate 1, 3, 4, 6 and 7 and a number of coursework assessments and exam questions are devoted to such work. Finally, all of the examinations assess skills 5-7 whist skills 1-4 are covered in examinations, course work and projects.

C. Subject, Professional and Practical Skills

Subject/Professional/Practical Skills	*Teaching/Learning Methods and Strategies*	*Assessment*
Students will be able to: 1. Mathematics to support a variety of engineering related techniques. 2. Analysis of static and dynamic systems in context 3. Design and drawing skills relating to the elicitation and interpretation of requirements, the generation and evaluation of alternative solutions through the use of both real and virtual models, and understanding the engineering implications of design specifications. 4. Materials selection and testing 5. Project management, including the management of multi-disciplinary projects.	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. These skills are introduced at level 1 and then drawn into sharper focus at levels 2 and 3. These are applied to more in-depth, specialist technical topics in level M. 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. The skills will be contextualised to the motorsport industry as far as is possible.	The possession of these skills is demonstrated both by practical laboratory work & coursework and by examination. This will include both individual and team based projects. The practical nature of some of the skills (namely 3 & 4) to be acquired means that these are specifically addressed by particular modules. The more generic skills (1, 2 and 5) are assessed at various points across the programme. In particular, skill 5 is applied and assessed via both individual and group project work that commences at level 1 on continues through each year up to level M. In the group activities assessment relates both to the technical content of the work and to the management of team and task.

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".	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 sessions. ♦ Students participate in individual tutorials ♦ Students are required to make formal presentations in certain modules.	These skills are demonstrated in a variety of contexts including • examinations • presentations • individual and group projects or assignments • laboratory work In particular, a variety of transferable skills are assessed in modules UFPED8-30-1, UFPENX-20-2, UEPEEL-20-3, UFPED7-30-M and in the individual project modules UFPERX-30-3 and UFPERY-30-M.
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.	2. Skill two is developed through a variety of methods and strategies including the following: ♦ Students conduct self-managed practical and research work ♦ Students participate in practically-oriented laboratory sessions ♦ Students work through practical work-sheets ♦ Students practice design	
3. IT Skills in Context (to use software in the context of problem-solving investigations, and to interpret findings)	3. Skill three is developed widely throughout the programme.	
4. Problem formulation: To express problems in appropriate notations.	4. Skill four is developed through a variety of methods and strategies including the following: ♦ Students develop understanding and experience of problem solving techniques ♦ Students practice design ♦ 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.	5. Skill five is developed through a variety of methods and strategies including the following: ♦ Students develop problem-solving programs ♦ Students are encouraged to research relevant topics ♦ Students are encouraged to use facilities (such as the library and internet) to discover information ♦ Students are encouraged to consider how learning might be gained to the design of specific experimental procedures or programmes.	

6. Comprehension of professional literature: to read and to use literature sources appropriate to the discipline to support learning activities.	6. Skill six is developed through a variety of methods and strategies including the following: ♦ Students are encouraged to access material from a variety of sources, including, but not limited to, books, journals and the internet. ♦ Students are encouraged to develop judgement about the relative worth of material from different sources. ♦ In particular, modules UFPENX-20-2, UFPERX-30-3 and UFPERY-30-M require students to undertake and report upon a technical literature survey.	
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.	7. Skill seven is developed through a variety of methods and strategies including the following: ♦ Students develop team working skills through a variety of group based exercises, commencing in Engineering Design (UFPED8-30-1). These skills are further developed in the Group Project Management module (UFPENX-20-2), Operations and Quality Management module (UFPEEL-20-3) and MEng Group Project (UFPED7-30-M), which are entirely based on group activities.	

Section 4: Programme Structure - MEng Motorsport Engineering (2008)

MEng Individual Project (Part B) UFMERY-30-M	Advanced Chassis UFMEVE-15-M	Energy & Environment Management Tools UFMEVF-15-M	MEng Group Project UFMED7-30-M	30 credits 2 modules drawn from Option List A (below)

MEng Individual Project (Part A) UFMERX-30-3	Operations and Quality Management UFPEEL-20-3	Motorsport Performance UFMEJU-40-3	Structural Integrity and Safety UFMEJN-30-3

Year 2P (Industrial Placement Year)

Design Embodiment and Materials Selection UFMEEN-20-2	Group Project Management UFPENX-20-2	Motorsport Applications Engineering UFMEQH-40-2	Mathematics for Mechanical Engineering UFQEFB-20-2	Mechatronics UFMEDH-20-2

Electrical Interface UFEE6U-10-1	Stress & Dynamics UFMEQT-20-1	Thermodynamics & Fluids UFMEQU-20-1	Engineering Design 1 UFPED8-30-1	Materials and Manufacturing Processes UFMEDB-20-1	Introductory Maths UFQETG-10-1 / Calculus Investigation UFQETJ-10-1	Engineering Mathematics UFQETH-10-1

Option List A
Electromechanical Systems Integration (UFMEEA-15-M), Structural Integrity In Design (UFMEBP-15-M), Concurrent Engineering (UFMEEC-15-M), Innovation In Operations Management (UMMC9U-15-M)

Core modules (thick border) | Option modules (thin border)

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 equivalent to Mathematics at A2 Level (at grade C or above), plus evidence of achievement equivalent to A2 Level in another scientific discipline (for example, physics, chemistry, engineering, design and technology). The normal offer will be 280-300 UCAS Tariff points.

It should be noted that years 1 and 2 of the MEng Motorsport Engineering are common with the BEng Motorsport Engineering. Progression to MEng is dependant upon the achievement of a 60% average across 100 credits at level 2.

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, practical or laboratory classes, group activities and individual project work. Where modules are common with other programmes, students will typically be taught together (which gives students the opportunity to appreciate the material from the viewpoint of different engineering disciplines). However, a specialist flavour may be given to a common module through the provision of discipline specific practical, laboratory or tutorial material supporting a core of common lectures.

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 offers pastoral care through its Student Advisers, a team of staff who provide a comprehensive, full-time student support service on a drop-in basis or by appointment. All students on a given degree 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 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.

Engineering Facilities
The Faculty offers a wide variety of specialised engineering facilities that will be used during the teaching of

this degree. In some cases, these items will be actively used by students, and in other, will be used for focussed demonstrations relating to particular theory or techniques. These facilities include:

- Wind tunnel for three dimensional flow analysis, flow visualisation, and six element strain gauge balance for force measurement;
- 2 dedicated engine test cells with monitoring equipment including exhaust gas analysis and in-cylinder pressure measurement;
- A motorcycle rolling road dynamometer with an instrumented Triumph 600cc motorcycle;
- ECU programming software and exhaust gas analysis equipment;
- A Formula Ford racing car with space frame chassis;
- Calibrated surface with four-wheel weighing equipment and suspension geometry tools;
- Structures laboratory including lightweight structures, advanced composite materials, computer controlled materials testing machines;
- Materials analysis laboratory including scanning electron microscope;
- Water channel for visualisation of three-dimensional flow and turbulence analysis;
- Laser doppler anaemometry;
- Matlab software for simulation of dynamic systems;
- Vibration analysis rigs;
- Six axis “hexapod” stiffness testing machine;
- CAD suite providing access to SDRC-IDEAS (solid modelling CAD and finite element analysis software);
- Thermofluid heat transfer modelling facilities;
- Computational fluid dynamics packages (CFD);
- Rapid prototyping and fully integrated computer aided manufacture and CNC machining facilities;
- Digital and analogue co-ordinate measuring machinery;

External Facilities

The facilities and expertise available in-house will be enhanced through a variety of collaborative opportunities provided by links with motorsport teams, manufactures and circuits. The Placement year provides opportunities for real-world, industrially based final year projects.

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 BIT students; including Software Design Tools development environment, CAD, finite element analysis, mathematics and statistics packages to support the taught programme.

Section 8 Reference Points/Benchmarks

In designing this programme, the faculty has drawn upon the following external reference points:
1. The QAA Framework for Higher Education Qualifications in England, Wales and Northern Ireland
2. The QAA Benchmark Statement for Engineering
3. UWE's Learning & Teaching Strategy

The QAA Framework for Higher Education Qualifications in England, Wales and Northern Ireland describes the attributes and skills expected of Honours graduates. It is our view that the learning outcomes of this programme are fully consistent with the qualification descriptor in the Framework, and hence that graduates will be able to demonstrate that they meet the expectations of the Framework.

The **QAA 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.

National thinking in respect of the education of engineers for Motorsport applications was discussed at length at last summer's Motorsport Academy Conference entitled "Developing World Class Skills", and these discussions have played a significant role in the planning and design of this programme. Among the speakers representing the industrial viewpoint were Dr Pat Symonds, David Richards, Patrick Head, Sergio Rinland, Ross Brawn, Frank Dernei and David Lapworth.

It is anticipated that the Faculty will seek accreditation for the programme from the Institute of Mechanical Engineers.