Appendix 1

PROGRAMME SPECIFICATION DOCUMENT

1. Qualification	2. Programme Title	3. UCAS Code	4. Programme Type
MEng & BEng	**Mechanical Engineering**		**Single Subject Part Time & Full Time**

5. Main Purposes and Distinctive Features of the Programme

The purpose of this integrated programme of study is to educate prospective mechanical engineers to Masters level competence standards, thereby satisfying the academic requirements leading towards Chartered Engineer status with the Institute of Mechanical Engineers (IMechE) and preparing the student for meaningful professional employment in the Mechanical Engineering sector of industry.

The learning outcomes of this integrated programme of study are governed by the requirements contained within the UK Standards for Professional Engineering Competences (UK-SPEC) and its output statements for an 'integrated' MEng/BEng degree. These standards have been adopted from the Engineering Council (EC^{uk}), and hence, IMechE outcome and competence standards and are in line with the QAA framework and benchmarking for an integrated masters programme. The scheme also comes under the requirements and standards of the University of Bolton.

Section 6 of this document shows the General and Specific learning outcomes for MEng. Those indicated with an 'm' are enhancements of the outcomes of the BEng(Hons) outcome statements. The full complement of outcome statements covered by the programme can be seen in Appendix 7 of the Programme Handbook. In this way and within the 'integrated' nature of this programme, the BEng(Hons) and the MEng learning outcomes are provided for and covered by particular modules specifications and differentiation is maintained between the two streams. In other words, all BEng(Hons) learning outputs are automatically covered by the set of MEng output competences and specific 'm' statements are applicable to the MEng. This complies with the EC^{uk}/QAA/IMechE guidelines and framework for an integrated Masters degree. Both the MEng and the BEng (Hons) will contribute to the formation of Chartered Engineer status with the IMechE.

It is the intention of this programme that it will produce graduates that are:

- motivated to practice engineering
- enthusiastic, articulate, questioning and open-minded
- recognised nationally and internationally as highly competent engineering graduates
- aware of the financial, moral, legal, economic, environmental and cultural constraints in which they operate
- aware of current management practice
- committed to and prepared for lifelong learning

In doing so, the programme aims to:

- establish the relevance of engineering to real world problems
- use design as an integrative element in the whole of the degree
- incorporate health and safety, environmental issues and sustainability
- ensure content matches the needs and developments in modern industry and society
- encourage reflection on learning experiences
- develop modelling and analytical skills and the application of those skills
- involve breadth and depth of coverage to meet the needs of industry and society in technical, management and business topics
- encourage a process of personal development planning (pdp)

This MEng is broader in scope than the integral three year BEng (Honours) and covers topics such as strategic management, environmental, ethical and leadership issues alongside subject specific topics. The programme is also broadened by incorporating a language element as both an extra-curricular activity and within pdp. Specifically, language is a significant element within final year HE7 provision, plus MEng students are encouragement to do an industrial placement between HE6 and HE7; if possible within the country of their study language.

The integrated nature of this programme means that it may be pursued in two different ways, leading to two different outcomes; students entering the course may choose either the four year full-time route to MEng or

a three year full-time route to BEng (Hons). Additionally, there are review points at the end of each level to select those students who are suitable for continuation along the MEng route and those where it is deemed more appropriate for them to follow the BEng (Hons) route. MEng students must be achieving Upper Second Class levels of achievement at both the end of HE5 and HE6 for them to carry on the MEng route. BEng(Hons) students graduate after level HE6. MEng students graduate after HE7. Part-time routes and options are also available where individual programmes of study can be arranged. The programme is integrated by having combined MEng and BEng (Honours) where levels HE4 & HE5 are common. However the MEng is significantly different from that point on so as to achieve the differing MEng and BEng outcomes. The MEng differs from the BEng in having a greater amount of project work, of which a large proportion is group work, the inclusion of the language element and the broader curriculum; there is a greater range and depth of specialist knowledge and an underpinning of managerial and organisational awareness, giving a foundation for leadership and a wider appreciation of economic, social and environmental issues in engineering.

The programme covers, and/or has embedded in its delivery the subject areas and themes:

Engineering Science/Mechanics
Mathematics
Materials, Methods, Systems and Manufacture
Mechanical Design
Environmental Issues and Sustainability
Transferable Skills
Projects and Integrating Themes
Foreign Language & Global issues
Management & Organisation
Personal Development Planning

6. What a graduate should know and be able to do on completion of the programme

The following are the **General Learning Outcomes**: (Complying with IMechE accreditation criteria, interpreted from the Engineering Council (ECuk) document 'The Accreditation of Higher Education Programmes – May 2004'):

Knowledge and understanding in the context of the subject(s): *The student will:*

K1m be able to learn new theories, concepts, methods, etc, in unfamiliar situations.

K1 be able to demonstrate their knowledge and understanding of essential facts, concepts, theories and principles of engineering and its underpinning mathematics and science.

K2 have an appreciation of the wider multidisciplinary engineering context and its underlying principles.

K3 appreciate the social, environmental, ethical, economic and commercial considerations affecting the exercise of their engineering judgement.

Intellectual abilities in the context of the subject(s):
The student will:

C1m have the ability to develop, monitor and update a plan, to reflect a changing operating environment

C1 must be able to apply appropriate quantitative science and engineering tools to the analysis of problems

Subject-specific practical/professional skills:
The student will;

S1 possess practical engineering skills acquired through work carried out in laboratories and workshops, in industry through supervised work experience, in individual or group work, in design and in the use of computer software in design, analysis or control.

S2m understand the different roles within a team and the ability to exercise leadership.

S2 show evidence of group working and participation in a major project.

Other skills (e.g. key/transferable) developed in subject or other contexts
The student will:

O1 have developed transferable skills that will be of value in a wide range of situations.

O2m must possess the ability to monitor and adjust a personal programme of work on an ongoing basis and to learn independently

O2 have higher level Key Skills and include problem solving, communication, and working with others, as well as the effective use of general IT facilities and information retrieval skills.

C2 must be able to demonstrate creative and innovative ability in the synthesis of solutions and in formulating designs *C3 must be able to comprehend the broad picture and thus work with an appropriate level of detail*	*O3 must also have planning self-learning and improving performance as a foundation for life-long learning/CPD*

In addition to the above General Learning Outcomes, there are the following **Specific Learning Outcomes**: (Complying with the UK-Spec statements adapted by the IMechE. 'm' outcomes are Masters enhancements to the Specific Learning Outcomes covered for BEng(Honours) for Chartered Engineer status).

<u>Underpinning Science and Mathematics</u>:
The student will:

US1m have a comprehensive understanding of the scientific principles of mechanical engineering disciplines.
US1 have a knowledge and understanding of scientific principles and methodology necessary to underpin their education in mechanical and related engineering disciplines, to enable appreciation of its scientific and engineering context and to support their understanding of future developments and technologies

US2m have a comprehensive knowledge and understanding of mathematical and computer models relevant to the mechanical and related engineering disciplines and an appreciation of their limitations.
US2 have a knowledge and understanding of mathematical principles necessary to underpin their education in mechanical and related engineering disciplines and to enable them to apply mathematical methods, tools and notations proficiently in the analysis and solution of engineering problems.

US3m have an understanding of concepts from a range of areas including some outside engineering and the ability to apply them effectively in engineering projects.
US3 have an ability to apply and integrate knowledge and understanding of other engineering disciplines to support the study of mechanical and related engineering disciplines

US4m have an awareness of developing technologies related to mechanical engineering.

<u>*Design*</u>*:*
The student will:

D1m have a wide knowledge and comprehensive understanding of the design process and methodologies and the ability to apply them to unfamiliar situations.
D1 be able to investigate and define a problem and identify constrains including environmental

<u>Engineering Analysis</u>:
The student will:

E1m be able to use fundamental knowledge to investigate new and emerging technologies.
*E1 have an understanding of engineering principles and the ability to apply them to analyse key engineering processes***.**

E2m be able to extract data pertinent to an unfamiliar problem and apply its solution using computer based engineering tools when appropriate.
E2 the ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques

E3m be able to apply mathematical and computer-based models for solving engineering problems and have the ability to assess the limitations of particular cases.
E3 have the ability to apply quantitative methods and computer software relevant to mechanical and related engineering disciplines, to solve engineering problems

E4 understand and apply a systems approach to engineering problems.

<u>*Economic. Social and Environmental context*</u>*:*
The student will:

S1m have the ability to make general evaluations of commercial risks through some understanding of the basis of such risks.
S1 have a knowledge and understanding of commercial and economic context of engineering processes

S2m have extensive knowledge and understanding of management and business practices and their limitations and how these may be applied appropriately to strategic and tactical issues.
S2 have a knowledge of management techniques which may be used to achieve engineering objectives within that context

S3 have an understanding of the requirements for engineering activities to promote sustainable development.

and sustainability limitations, health and safety and risk assessment issues *D2 understand customer and user needs and the importance of considerations such as aesthetics.* *D3 identify and manage cost drivers.* *D4m have the ability to generate innovative design solutions for products, systems, components or processes to fulfil new needs.* *D4 Use creativity to establish innovative solutions* *D5 ensure fitness for purpose for all aspects of the problem including production, operation maintenance and disposal.* *D6 manage the design process and evaluate outcomes.*	*S4 have an awareness of the framework of relevant legal requirements governing engineering activities, including personnel health, safety and risk issues.* *S5 have an understanding of the need for a high level of professional and ethical conduct in engineering.* *<u>Engineering Practice</u>:* *The student will:* *P1m have a thorough understanding of current practice and its limitations and some appreciation of likely new developments.* *P1 have a knowledge of characteristics of particular equipment, processes or products* *P2m have extensive knowledge and understanding of a wide range of engineering materials and components.* *P2 have engineering workshop and laboratory skills* *P3 have an understanding of contexts in which engineering knowledge can be applied.* *P4 understand the use of technical literature and other information sources.* *P5 be aware of the nature of intellectual property rights and contractual issues.* *P6 have an understanding of appropriate codes of practice and industrial standards.* *P7 have an awareness of quality issues.* *P8m have the ability to apply engineering techniques taking into account a range of commercial and industrial constraints.* *P8 have the ability to work with technical uncertainty*

7. Qualities, Skills & Capabilities Profile

A Cognitive	B Practical	C Personal & Social	D Other
Problem Solving	Spatial Awareness	Time Management and Personal Planning	Professional Awareness
Analysis	Graphical Communication	Teamwork	Environmental Awareness
Creativity	Presentation Skills	Independent Work	Cost Awareness
Synthesis	Workshop/Laboratory Skills	Self Criticism	Social/Ethical Awareness
Reflection	Creating Products	Communication	Awareness of Developing Technologies
Critical Reasoning	Research Skills	Foreign Language	

8. Duration and Structure of Programme/Modes of Study/Credit Volume of Study Units

MEng: 4 years Full Time; 4½ - 6 years Part Time (Depending on entry level and module mix).
BEng (Honours): 3 years Full Time, 3 - 4½ years Part Time (Depending on entry level and module mix).
Masters Degree = 480 credits
Honours Degree = 360 credits;
Intermediate Awards of Diploma of Higher Education and Certificate of Higher Education available at 240 and 120 credits respectively.
All Masters degrees must include 120 credits at Level HE7.
All Honours degrees must include the study of 120 credits at Level HE6.

	Core Modules	Options	Project
Masters Level			
HE7 Masters Modules:	Language & Int'l Comms for Engineers (20) Managing Product Development (20) STORM (20) Design of Advanced Composites (20) International Comms & Environmental Issues (20) (Option)		MEng Group Project (40)
Part II			
HE6 Masters Modules:	Life Cycle Management (20) Advanced Thermofluids & Control (20) Advanced Materials & Structures (20) Finite Element & Difference Solutions (20)		MEng Design & Individual Project (40)
HE6 Honours Modules	Management & Enterprise in Engineering (20) Advanced Thermofluids & Control (20) Advanced Materials & Structures (20) Finite Element & Difference Solutions (20)		BEng (Hons) Design & Individual Project (40)
HE5 Masters/ Honours Modules	Engineering Applications (40) Mechanics of Materials & Machines (20) Thermofluids & Control Systems (20) Engineering Modelling & Analysis (20) Automobile/Mechanical Design (20)		
Part I			
HE4 Masters/ Honours Modules	Projects & Systems (40) Analysis & Computer Methods (20) Engineering Principles (20) Engineering Environment (20) Graphical Comms & Computer Modelling (20)		

9. Learning, Teaching and Assessment Strategy

Learning and Teaching Methods

Learning, teaching and module delivery is by a number of complimentary methods each tailored to the needs of the topic, the learning outcomes, student requirements, the available facilities and the requirements of the course.

Principally, learning and teaching will utilise both didactic and student centred approaches; didactic methods will include formal lectures, tutorials, demonstrations, presentations, led exercises and case studies, etc, whilst a more student centred independent learning environment would be achieved through programmed tutorials, problem solution exercises, design studies and assignments, projects, individual and group working, laboratory and/or workshop exercises and tests, and computer based exercises, modelling and analysis, etc.

The design and project work will take place in a dedicated engineering space, housing the resources necessary for adequate delivery of the modules and their subject matter. This dedicated space will house computing resources, work space, printing and scanning facilities, storage facilities for design exemplars, etc, plus the necessary presentation equipment to deliver lectures, presentations and demonstrations. Display will also form part of this environment.

Added to this, specific topic areas and modules have dedicated laboratory and workshop facilities such as an Engineering Materials Laboratory, Control Systems equipment, Advanced Materials workshop, General Purpose Engineering workshop, Engine Test Laboratory, Automobile workshop, etc,. All these facilities would be utilised in achieving the learning outcomes outlined above.

In addition, for those students following the MEng route, it is expected that the student will follow some extra-curricular activity in non-credit bearing, though certificated, language acquisition in parallel with the first three years of their course and also, where possible, complete an industrial placement between HE6 and HE7, preferably in the country of the language.

The course is delivered by both Part Time and Full Time modes of study.

Students are assessed and their progress monitored throughout each module, throughout each year and at the end of each year through Coursework, Project Work and End of Year examinations. The Examination Board sits at the end of each academic year. The Examination Board agrees module grades, student progression and degree classification. Assessments are individually linked to the learning objectives of each module and assessment weightings are governed by the relative importance of each assessment in respect of these objectives and the amount/quality of work required in achieving these objectives.

Transferable Skills are also encountered throughout the programme and depending upon the activity, type of assessment and/or the learning outcomes, these will be either taught, developed and/or assessed.

Assessment Methods

Assessments take place throughout each year and take various forms; Design/Project reports, Presentations, Viva Voce examinations, In-class Phase Tests, Open-book and Closed-book examinations, Design and Make Exercises, Essays, etc.

Assessment Classification System

The pass mark for an individual module = 40%

BEng (Honours) classification is calculated by taking a final weighted average of those modules worth a total of 200 credits; this includes marks for modules worth 80 credits at Level HE5 (weighted 30%) plus marks from modules worth 120 credits at Level HE6 (weighted at 70%), which represent the best marks achieved by a student at those levels.

For those students studying for MEng, performance is monitored and progression agreed at each level of the programme. In order to progress, students will normally be expected to achieve a performance level of Upper Second Class Honours at each level as they progress through the programme. Student not achieving this performance will continue their studies on the BEng (Honours) programme.

In exceptional circumstances a student may change their study route from BEng to MEng but this will be dependent on exceptional performance and agreed funding arrangements.

Achievement of MEng will be governed by successful completion of HE4, HE5 and HE6 to Upper Second Class Honours and Pass at level HE7.

BEng Honours Classification Bands:

$\geq 70\%$	First Class Honours
$69\% > 60\%$	Upper Second Class Honours
$59\% > 50\%$	Lower Second Class Honours
$49\% > 40\%$	Third Class Honours
$\leq 39\%$	Fail

10. Other Information *(including compliance with relevant University policies)*

Date programme first offered

September 2010

Admissions Criteria

Standard Requirements

Entry to BEng (Honours):

Foundation Year.
or
240 UCAS points via A-Level, AS-Level including Mathematics or Physical Science or BTEC National Diploma or Certificate
or
Scottish Highers, Irish Leaving Certificate, International/European Baccalaureate or appropriate internationally recognised qualification.

Entry to MEng:

300 UCAS points via A-Level, AS-Level including Mathematics or Physical Science or a BTEC National Diploma or Certificate
or
Scottish Highers, Irish Leaving Certificate, International/European Baccalaureate or appropriate internationally recognised qualification.

Non Standard Entry

- Mature student evaluation, taking into account work experience, type and level of previous qualifications, aptitude and general engineering awareness and expectations and dealt with on an individual basis..
- Part-Time entry to Level HE5 with Higher National Diploma or Certificate with Level 3 Mathematics and Engineering Science.

Indicators of Quality and Standards

Validation Panel comments and recommendations.
Comments and recommendations from external examiners and subject specialists.
QAA Benchmarking statements.
UK-Spec Learning Competencies
IMechE General and Specific Learning Outcome statements.
Compliance with University regulations and guidelines.
Retention and Progression statics.
Student destination points and employment.