BEng in Engineering Sustainability

UCAS code: H220

Awarding Institution: The University of Reading
Teaching Institution: The University of Reading
Relevant QAA subject benchmarking group(s): Engineering
Faculty of Science Programme length: 3 years
For students entering Part 1 in 2003 Date of specification: June 2004
Programme Director: Prof. A. G. Atkins
Programme Advisers: Prof. A. G. Atkins and Dr. J. C. A. Ellick
Board of Studies: Mechanical Engineering
Accreditation: Institution of Mechanical Engineers (proposed)

Summary of programme aims and learning outcomes

The BEng programme aims to provide students with up-to-date professional and academic training broadly based upon mechanical engineering that is relevant to the needs of the engineering profession and industry. As the programme proceeds an increasing emphasis is given to aspects of engineering which relate to sustainability. Specialised advanced options draw on the research interests of the Faculty which relate to Sustainability including Renewable Energy, Climate Change and Construction Management.
(For a full statement of the programme aims and learning outcomes see below)

Transferable skills

The University's Strategy for Teaching and Learning has identified a number of generic transferable skills which all students are expected to have developed by the end of their degree programme. By the end of this programme students are expected to be competent at: using evidence-based methods in analysis; using creativity and innovation as part of engineering design and problem solving; using information technology; written and oral communication; working in a team; time and resource management; critical self-evaluation. These competencies, as well as business awareness and career management, are embedded within modules throughout the programme.

Programme content

The following profile states which modules must be taken (the compulsory part), together with one or more lists of modules from which the student must make a selection (the 'selected' modules). Students must choose such additional modules as they wish, in consultation with their programme adviser, to make 120 credits in each Part.

Part 1 (three terms)		*Credits*	*Level*
Compulsory modules			
CE1CIC	*Information and Communication*	10	C
CE1CM1	*Management 1*	10	C
CE1EA2	*Structures and Materials 1*	20	C
CE1EB2	*Energy 1*	20	C
CE1EC2	*Introduction to 3D modelling*	10	C
CE1ED2	*Software for Engineers*	10	C
EC103	*Economics for Construction & Engineering*	10	C
EG1C2	*Engineering Mathematics*	20	C
LW1A05	*General Introduction to Law*	10	C

Part 2 (three terms)		*Credits*	*Level*
Compulsory modules			
CE2CM2	*Management 2*	10	I
CE2CS1	*Sustainability 1*	10	I
CE2EA2	*Structures and Materials 2*	20	I
CE2EB2	*Energy 2*	20	I
CE2EC2	*Analytical Methods and their application*	20	I
CE2ED2	*Design and Manufacture*	20	I
CE2EE2	*Power Systems and Drives*	10	I
CE2EF2	*Systems and Services*	10	I

Part 3 (three terms)		*Credits*	*Level*
Compulsory modules			
CE3CFM	*Facilities Management*	10	H
CE3CS2	*Sustainability 2*	10	H
CE3EE2	*Sensors and NDT*	10	H
CE3EG2	*Energy and the Environment*	20	H
CE3EM2	*Sustainability Design Project*	30	H
Optional modules (choose modules to make up 40 credits)			
CE3CFM	*Facilities Management*	10	H
CE3CHF	*Human Factors*	10	H
MT37C	*Climate & Climate Change*	20	H
XXXXX	*Option in Soil Science*	20	H
XXXXX	*Foreign Language*	20	C or I

Progression requirements

To proceed to Part 2 it is necessary to obtain at least:

- An overall average of 40% in 120 credits
- 30% in each module taken in Part 1

To proceed to Part 3 it is necessary to obtain at least:

- An overall average of 40% in 120 credits
- 30% in each module taken in Part 2

To qualify for the award of the degree, it is necessary to pass overall. To pass with honours it is necessary to obtain at least 40% in module CE3EM2 and achieve a minimum satisfactory standard (30%) in every module.

The final degree assessment is based on Part 3 and Part 2 with weightings of 2 to 1 respectively.

Summary of teaching and assessment

Teaching is organised in modules that typically involve both lectures and practical work. Most modules are assessed by a mixture of coursework and formal examination. Some modules are assessed only as coursework.

Admission requirements

Entrants to this programme are normally required to have obtained:
A Level: 240 points with grade C in A Level Mathematics; or
International Baccalaureat: 26 points including 4 in Higher Mathematics and Physics; or

Advanced GNVQ: Merit in one of the following subject areas: Engineering, Information Technology or Science, accompanied by A Level Mathematics Grade C; or
Scottish Advanced Highers: Grade C in Mathematics and Cs in two other subjects; or
Irish Leaving Certificate: Grade C in Mathematics and two Bs and 2 Cs in four other subjects; or
BTEC: with mostly distinctions in individual subjects but including at least a merit in Mathematics for Higher Education.
Two AS grades are accepted in place of one A-Level (except for Mathematics), provided the subjects have not been taken at A-Level.

Support for students and their learning
University support for students and their learning falls into two categories. Learning support includes IT Services, which has several hundred computers and the University Library, which across its three sites holds over a million volumes, subscribes to around 4,000 current periodicals, has a range of electronic sources of information and houses the Learning Resource Centre with some 200 workstations. There are language laboratory facilities both for those students studying on a language degree and for those taking modules offered by the Institution-wide Language Programme. Student guidance and welfare support is provided by Personal Tutors, the Careers Advisory Service, the University's Special Needs Advisor, Study Advisors, Hall Wardens and the Students' Union.

Within the providing School support is given through practical classes and tutorial classes linked to lecture programmes. There is a Course Adviser to offer advice on the choice of modules within the programme. The School also provides computing facilities dedicated to support of Engineering students.

Career prospects
It is expected that the majority of students who have followed this programme will go into technical careers in the engineering or construction industry. Other career choices are in research and development and in government agencies. Graduates could also opt for careers in the business world, in finance or in commerce.

Opportunities for study abroad
Although there are no formal arrangements for the BEng programme in Engineering Sustainability, informal arrangements may be possible, especially in connection with projects.

Educational aims of the programme
The BEng programme aims to provide students with up to date professional and academic training in mechanical engineering that is relevant to the needs of the engineering profession and industry. The programme focuses on addressing the way in which engineering and technology can enhance sustainability.

Programme Outcomes

The programme provides opportunities for students to develop and demonstrate knowledge and understanding, skills, qualities and other attributes in the following areas:

Knowledge and Understanding

A. Knowledge and understanding of:	**Teaching/learning methods and strategies**
1. Appropriate mathematical methods 2. Science appropriate to engineering sustainability 3. Principles of IT and Communications (ITC) relevant to engineering sustainability 4. General principles of design 5. Management and business practices (including finance, law, marketing, personnel and quality) 6. Professional and ethical responsibilities including the global and social context of engineering 7. Manufacturing and/or operational practice 8. Codes of practice and the regulatory framework 9. Requirements for safe operation	The knowledge required for the basic topics is delineated in formal lectures supported by laboratory exercises, tutorials and problems. Students are given opportunities to use their engineering knowledge in design and problem solving situations. *Assessment* Most knowledge is tested through a combination of coursework and unseen formal examinations. Design and project work plays an important role in assessing the extent to which students have learned to make use of the knowledge they have acquired.

Skills and other attributes

B. Intellectual skills:	**Teaching/learning methods and strategies**
1. Ability to select and apply appropriate mathematical methods for modelling and analysing engineering problems 2. Use of scientific principles in the development of engineering solutions to practical problems 3. Use of scientific principles in the modelling and analysis of engineering systems, processes and products 4. Ability to select and apply appropriate computer based methods for modelling and analysing engineering problems 5. Analysis of systems, processes and components requiring engineering solutions 6. Creation of new processes or products through synthesis of ideas from a wide range of sources 7. Commercial risk evaluation 8. Ability to produce solutions to problems through the application of engineering knowledge and understanding 9. Ability to undertake technical risk evaluation	Design and project work are an important part of the processes whereby students develop their intellectual skills. Exercises are designed to develop different aspects of these skills, and, in particular, to develop an ability to integrate the wider aspects of sustainability into engineering systems, processes and products. *Assessment* Whilst the more theoretical intellectual skills are assessed through formal examination, the more applied aspects are tested in design and project work.

C. Practical skills:

1. Skill in the use of appropriate mathematical methods for modelling and analysing sustainability problems
2. Use of relevant test and measurement equipment
3. Experimental laboratory work
4. Use of engineering IT tools
5. Design of a component
6. Practical testing of design ideas in laboratory or through simulation, with technical analysis and critical evaluation of results
7. Research for information to develop ideas further
8. Ability to apply engineering techniques taking account of industrial and commercial constraints
9. Project management

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Teaching/learning methods and strategies

Students obtain practical skills relating to manufacturing and assembly in special sessions with a coordinating theme, while scientifically based skills will be developed in the laboratory, and in evaluating results of experiments. There are many activities which require students to design at different levels.

Design work and a design perspective are apparent throughout the programme.

Assessment

These skills are assessed through coursework, although some "workshop" skills are only formally assessed in qualitative terms.

D. Transferable skills:

1. Manipulation and sorting of data
2. Presentation of data in a variety of ways
3. Use of scientific evidence based methods in the solution of problems
4. Use of general IT tools
5. Use of creativity and innovation in problem solving
6. Working with limited or contradictory information
7. Effective communication
8. Life long learning
9. The engineering approach to the solution of problems
10. Time and resource management
11. Teamwork and leadership
12. Career management

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Teaching/learning methods and strategies

The various different project and laboratory exercises which are distributed though the curriculum are structured to instil the transferable skills identified. A specific module has been defined for Career Management, but its delivery is embedded in other parts of the programme, and it is not listed in the Programme Content above.

Assessment

Because of the integration of this aspect of learning within other elements, much of the assessment is indirect, and achievement of these outcomes implicit in the achievement of other objectives. Thus, for example, submission of a project work by a required deadline after many months of work requires effective planning; or satisfactory completion of a group task in which a student has participated depends upon effective teamwork, and so on.

Please note: This specification provides a concise summary of the main features of the programme and the learning outcomes that a student will achieve and demonstrate upon participation in the learning opportunities that are provided. More detailed information on the learning outcomes, content and teaching, learning and assessment methods of each module can be found in module descriptions in the programme handbooks.