# The Institution of Mechanical Engineers

## Educational Base
## and
## Criteria for Degree Accreditation

Ed.Base Draft Issue 06/06/04 by L.C
Ed.Base Issue 1 08/12/04 by K.H
Ed.Base Issue 2 24/02/05 by K.H

# Educational Base and Criteria for Degree Accreditation

The Educational Base and Criteria for Degree Accreditation defines the academic requirements for membership of the Institution of Mechanical Engineers (IMechE) and registration with Engineering Council (UK) as a Chartered Engineer (CEng) or as an Incorporated Engineer (IEng). It is intended as guidance to those who are designing degrees and considering whether to submit them for accreditation by the IMechE. The Institution recommends that, in addition to reading this document, degree designers familiarise themselves with the UK-SPEC[1] It should be noted that the IMechE accredits against the content of Educational Base and Criteria for Degree Accreditation, as its interpretation of the UK-SPEC.

Although this document refers only to the accreditation of degrees, IMechE recognises the role of the HNC/D (plus a period of appropriate Further Learning) in the formation of Incorporated Engineers and will include guidance on this as soon as it becomes available.

**CONTENTS**



1 UKSPEC (UK Standard for Professional Engineering Competence) is the Engineering Council (UK) policy statement containing the requirements for the formation of Chartered and Incorporated Engineers and Engineering Technicians. The UKSPEC was published in December 2003.

## 1. Introduction

Mechanical Engineering is ever-changing and offers diverse career opportunities from specialist to generalist, transfer between 'career routes' and, increasingly, demands professional qualification. In recognition of this IMechE defines Mechanical Engineering as:

> *"…the innovative application of engineering and management sciences that underpin existing and emerging technologies, to the complete life-cycle of all mechanical devices, machines and systems."*

Mechanical Engineers make a major contribution to the sustainable development of our built environment, the generation of wealth in every sector of the economy and the quality of life of each member of society. With over 80,000 members around the world and a range of membership benefits and services, IMechE has the resources and expertise to support and recognise Mechanical Engineers' professional development from the early stages and on throughout their careers. IMechE's vision is:

> *"To be the natural professional home for all involved in Mechanical Engineering."*

In pursuit of this the Institution welcomes into membership engineers qualified as or working towards Chartered or Incorporated status. IMechE believes that Chartered and Incorporated Engineers, although different, contribute equally to society and as such have equal status.

IMechE is committed to encouraging and developing a culture of *lifelong learning* and supporting the ongoing professional development of a broad range of Mechanical Engineers. Consequently it accredits a wide range of engineering degrees that provide suitable academic preparation for a career in Mechanical Engineering as Chartered or Incorporated Engineer.

## 2. The Formation of Professional Engineers

Engineering is a profession directed towards the skilled application of a distinctive body of knowledge based on mathematics, science, design, materials and manufacturing, integrated with business and management, which is acquired through education and professional formation in a particular engineering discipline. It is directed to developing a technological outcome that provides the infrastructure, goods and services needed by society.

The following general statements about definitions, roles and responsibilities provide the basis for the setting of standards, the specification of the appropriate educational preparation and programmes for initial professional development, and for the assessment of professional competence and commitment. All engineers have a responsibility to society with regard to safety and the ethical and environmental impact of their work. The teaching of engineering and the professional development of engineers, as well as its practice, are acceptable professional activities. More detailed specifications of the roles and responsibilities are given in the UK-SPEC.

2.1 *Chartered Engineer*

Chartered Engineers are primarily concerned with the development and progress of technology through innovation, creativity and change. Their work involves the application of a significant range of fundamental scientific principles, enabling them to research, develop and apply new technologies, develop and promote advanced designs and design methods, introduce new and more efficient production techniques, marketing and construction concepts, and pioneer new engineering services and management methods. In these and many other ways they are vital to sustainable development, wealth creation, environmental protection and quality of life improvements for all. They may be involved with the management and direction of high risk and / or resource intensive projects. Professional judgement is a key feature of their role, allied to responsibility for the direction of important tasks, which may include the management of industrial, commercial, public or not-for-profit enterprises of any size.

2.2 *Incorporated Engineer*

Incorporated Engineers are exponents of today's technology and, to this end; they design, develop, manufacture, maintain and manage applications of current and developing technology at the highest efficiency. Incorporated Engineers require a detailed understanding of a recognised field of engineering, so they can exercise independent technical judgement and management in that field. In these ways and many others they are vital to sustainable development, wealth creation, environmental protection and quality of life improvements for all. They provide, independently and as leaders, a significant influence on the overall effectiveness of the organisation in which they work, often in key operational management roles.

2.3 *UK-SPEC*

The UK-SPEC explains the value of becoming recognised as a Chartered Engineer or Incorporated Engineer. It describes the requirements that have to be met for registration, and gives examples of ways of doing this. This standard should enable individuals and employers to find out whether they or their staff can meet the requirements, and explains the steps necessary to achieve national registration. The UK-SPEC replaces SARTOR 3 and seeks to continue to:

- maintain the standards of engineering professional development
- to encourage a greater diversity of learning and teaching delivery modes
- to promote a seamless progression of lifelong learning
- to broaden and strengthen the emphasis on the generic competences of professional engineers; and to
- place greater emphasis on the output from accredited courses

The benchmark routes for the formation of professional engineers are a seamless, progression of learning experiences beginning with an accredited degree and continuing through Initial Professional Development (IPD) in early employment. Although formal education is the usual way it is not the only way of demonstrating the underpinning knowledge and understanding for professional competence. Once qualified, professional engineers are expected to keep up to date by continued learning throughout (and in support of) their career through Continuing Professional Development. Institution membership and registration with the Engineering Council (UK) are recognised benchmarks against which the engineer can judge and demonstrate professional progress.

The benchmark routes for the formation of professional engineers are:

| *Incorporated Engineer* | *Chartered Engineer* |
|---|---|
| An accredited bachelors degree followed by a period of structured and approved IPD. | An accredited BEng (Hons) degree, plus either an appropriate Masters degree or appropriate further learning to Masters level followed by a period of structured and approved IPD. Or an accredited integrated MEng degree. |

It is recognised that these are benchmarks and, while considerable flexibility may be used in reaching them, all alternative pathways will be measured against these ideals. IMechE recommends that mechanical engineers complete their IPD through the Institution's Monitored Professional Development Scheme (MPDS).

## 3. The Educational Base

The educational base is the development of a student's potential in preparation for a career as a registered professional engineer, through understanding engineering principles and practices, developing skills and the motivation to continue learning throughout life.

The UK-SPEC sets out the standards required for registration and identifies the following pathways to meet the educational base requirements:

| *Incorporated Engineer* | *Chartered Engineer* |
|---|---|
| An accredited bachelors degree, extending over three academic years (the *benchmark* educational base en route to registration)<br>A suitable Higher National Diploma or Certificate or a Foundation degree followed by appropriate further learning to degree level (an *alternative* educational base en route to registration)[2]. For information about Further Learning please refer to section 9. | An accredited BEng (Hons) degree, extending over three years, plus either an appropriate Masters degree, or appropriate further learning to Masters level (the *benchmark* educational base en route to registration). For information about further learning please refer to section 9.<br>An accredited integrated MEng degree, extending over four academic years (an *alternative* educational base en route to registration). |

Full-time BEng (Hons) degrees accredited for CEng and bachelor degrees accredited for IEng are of three-years duration. Full-time Masters degrees accredited for CEng, i.e. accredited MEng degrees, are of four-years duration. It is recognised that degrees in Scotland are normally one year longer than the equivalent degree in England, Wales and Northern Ireland. In addition, IMechE encourages the use of part-time and sandwich degrees of an extended duration.

**Throughout this document degrees referred to as 'BEng (Hons) accredited for CEng' are those intended to contribute to CEng formation while those referred to as 'bachelor degrees accredited for IEng' are those intended to contribute to IEng formation.** The Institution recognises that universities may choose to award IEng-style degrees with honours; it is suggested, however, that using the nomenclature BEng (Hons) for IEng-style degrees may cause confusion.

[2] The Institution recognises and values the HND plus Further Learning route to IEng in the same way as it does the BEng(Hons) plus Further Learning route to CEng. This issue is being examined and supplementary guidance will be issued as soon as it is available.

All accredited degrees should produce graduates who are:

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

Bachelor degrees accredited for IEng should:

- establish the relevance of engineering to real world problems
- cultivate high level technical proficiency in a major field of engineering, including the ability to tackle a variety of practical problems, however specialised
- ensure that the content matches the needs of modern industry and society at large
- develop an understanding of matters such as design reliability and maintenance, product quality and value, marketing, safety
- incorporate health and safety, environmental issues and sustainability throughout the degree
- develop an understanding of relationships with clients, customers and colleagues, including the supervision of staff, and the ability to work as a member of an engineering team

Degrees accredited for CEng should:

- establish the relevance of engineering to real world problems
- use design as an integrative vehicle permeating the whole degree
- incorporate health and safety, environmental issues and sustainability throughout the degree
- ensure that the content matches the needs of modern industry and society at large
- encourage understanding of and reflection on the learning experiences
- ensure the students develop modelling and analytical skills comparable to the best in the world
- involve breadth and depth of coverage to meet the needs of industry and society in technical, management and business topics, and develop relevant inter-personal skills

It is expected that all the above will be covered during an accredited degree. However, the depth and breadth of coverage will depend on the particular emphasis and whether the degree is accredited for CEng or IEng and the level of the degree.

From 2004, all courses of study that are accredited by the IMechE are required to comply with UK-SPEC. One requirement of UK-SPEC is that accreditation is to be based on the courses meeting the output standards (or learning outcomes) that have been defined by the IMechE. The output standards for accredited engineering programmes have been derived from the generic statement of learning outcomes adopted by the $EC^{UK}$'s Registration Standards Committee. The learning outcomes encompass two different categories **general** and **specific** as outlined in appendix 2.

The course provider is responsible for defining the output standards of the course of study. These output standards must satisfy the minimum $EC^{UK}$ standards and must be at the appropriate level of achievement as defined in the QAA national qualifications framework[3].

For further information on the assessment of output standards in the accreditation process please refer to section 10.1.

3 QAA's website (www.qaa.ac.uk) provides details of qualifications frameworks and the level descriptors.

## 4. Bachelor degrees accredited for IEng

The bachelor degree accredited for IEng is the preferred route to completion of the educational base for registration as an Incorporated Engineer. It should provide a platform for motivated students with the potential to pursue successful careers that demand technical proficiency at a high level, including the ability to solve a wide range of applications-orientated problems however specialised the product or engineering processes. Therefore, the IMechE will accredit a broad range of degrees designed to support the development of Incorporated Engineers for a wide range of career paths within Mechanical Engineering, please refer to appendix 6 for an indicative list of degrees that the IMechE will consider for accreditation.

The learning outcomes of the degree are those appropriate to a Bachelors degree within the QAA framework and as a first-cycle degree as defined by the Bologna Agreement[4] It is a three-year full-time (or equivalent) first degree that should take place in a well resourced and managed environment dedicated to engineering education. This degree is focussed on the engineering knowledge and skills needed to apply current technology.

### *4.1 Output*

To be suitable for accreditation the degree should prepare graduates for Incorporated Engineer status by developing strong problem solving skills and the ability to apply current technology. Graduates should receive a relatively broad education in engineering and develop the versatility and depth of understanding needed to deal with problems in one or more branches of engineering. The graduate should be able to implement existing technology to its best effect across a range of engineering sectors and be proficient in the use of Codes of Practice and Standards relevant to his/her specialisation. The specific learning outcomes of the degree are expressed in terms of underpinning science and mathematics, engineering analysis, design, economic, social and environmental context and engineering practice as described in Appendix 2.

### *4.2 Breadth of Education*

Graduates need a foundation covering a range of engineering sectors and in the earlier periods of study the bachelor degree accredited for IEng should provide a relatively broad foundation in Mechanical Engineering appropriate to the aims, objectives and learning outcomes of the degree. Single discipline degrees need to provide some awareness of subjects beyond the degree specialisation. The selection of subjects should be coherent and cohesive to support the learning outcomes of the degree; the IMechE is unlikely to accredit if a non-coherent ‘pick and mix’ approach has been adopted to subject selection.

[4] 4 The Bologna Agreement, signed by the UK in 1999, introduced a higher education framework essentially based on two main cycles, undergraduate and graduate. Access to the second cycle requires successful completion of first cycle studies, lasting a minimum of three years. The degree awarded after the first cycle must be relevant to the European labour market as an appropriate level of qualification. The second cycle should lead to the master and/or doctorate degrees as in many European countries.

*4.3 Depth of Understanding*

The final year should include a coherent selection of subjects in support of the degree specialisation, the majority of these subjects being chosen from the engineering subjects (Appendix 1) that support the aims, objectives and learning outcomes of the degree.

*4.4 Creativity and Innovation*

Graduates from a bachelor degree accredited for IEng should be aware of the need for creativity and innovation in engineering and how their expertise in applying technologies plays a key role in all stages of the design process. They should have the creativity to solve a wide range of applications-based engineering problems developed through open-ended design, make and test exercises, design and investigative project work.

*4.5 Subjects Studied*

Each degree should have its own particular emphasis and characteristics, clearly articulated in its aims, objectives and learning outcomes (see also paragraph 4.1); the subjects studied during the degree (see Appendix 1) should support these in a progressive manner.

## 5. BEng (Hons) degrees accredited for CEng

The BEng (Hons) degree accredited for CEng, when followed by either an appropriate Masters degree or period of further learning to Masters level (see section 9), is the exemplifying route to completion of the educational base for registration as a Chartered Engineer. It should provide a platform for motivated students with the potential to pursue successful careers progressing to senior positions, with responsibilities ranging from technical specialist to engineering generalist. Therefore, the IMechE will accredit a broad range of BEng (Hons) degrees designed to support the development of Chartered Engineers for a wide range of career paths within Mechanical Engineering, please refer to appendix 6 for an indicative list of degrees that the IMechE will consider for accreditation.

The learning outcomes of the BEng (Hons) degree accredited for CEng are those appropriate to a Bachelors degree within the QAA framework and as a first-cycle degree as defined by the Bologna Agreement. It is a three-year full-time (or equivalent) first degree that should take place in a well resourced and managed environment dedicated to engineering education.

*5.1 Output*

To be suitable for accreditation the BEng (Hons) degree accredited for CEng should prepare graduates to progress to Chartered Mechanical Engineer status (via a period of appropriate further learning) by developing the ability to practise at the highest level in Mechanical Engineering, to move towards positions of responsibility and provide technical and managerial leadership. Graduates from a BEng (Hons) degree accredited for CEng should have received a broad education in engineering and developed the versatility and depth of understanding required to deal with new and unusual problems in one or more branches of engineering. The graduate from a BEng (Hons) degree

accredited for CEng should be imaginative, creative and be able to implement changes in technology. They should be able to provide technical and managerial leadership in their chosen branch of engineering. Please refer to Appendix 2 for further information about the specific learning outcomes accredited degrees should seek to develop in graduates.

*5.2 Breadth of Education*

In the earlier periods of study the BEng (Hons) degree accredited for CEng should provide a broad foundation in Mechanical Engineering appropriate to the aims, objectives and learning outcomes of the degree. The BEng (Hons) degree accredited for CEng graduate requires a foundation that covers the broad spectrum of engineering and this requires study beyond the intended area of specialisation. Unified and Joint Honours degrees can more easily achieve breadth where this has always been a central theme. Single discipline degrees need to provide an awareness of subjects beyond the degree specialisation. The selection of subjects should be coherent and cohesive to support the learning outcomes of the degree. A non-coherent 'pick and mix' approach to subject selection is unlikely to lead to accreditation.

*5.3 Depth of Understanding*

The final year should include a thorough treatment of a coherent selection of subjects in support of the degree specialisation, the majority of these subjects being chosen from the engineering subjects (Appendix 1) that support the aims, objectives and learning outcomes of the degree.

*5.4 Creativity and Innovation*

These attributes are usually developed through:

- design, make and test exercises in the first two years
- design project work throughout the degree, involving open-ended[5] problems
- an investigative project with individual assessment where the student takes full responsibility for the work (usually undertaken in the final year of the degree)

*5.5 Subjects Studied*

Each degree should have its own particular emphasis and characteristics, clearly articulated in its aims, objectives and learning outcomes; the subjects studied during the degree (see Appendix 1) should support these in a progressive manner.

## 6. How does the BEng (Hons) degree accredited for CEng differ from the bachelor degree accredited for IEng?

The BEng (Hons) degree accredited for CEng should prepare students to move towards becoming a Chartered Engineer through completion of a Masters degree or period of further learning. A Bachelor

5 The term *open-ended* indicates engineering problems with no pre-determined solution

degree accredited for IEng should prepare students for a career as an Incorporated Engineer. Therefore, compared with a bachelor degree accredited for IEng, degrees accredited as BEng (Hons) accredited for CEng should normally provide students with:

- **A broader education in engineering**, which, in addition to a basis of appropriate engineering science and engineering subjects in support of the degree title, provides some broadening subjects
- **Greater versatility**, through cross-disciplinary integration of the technical courses
- **Greater depth of understanding** of a coherent selection of relevant analytical subjects which may include some study appropriate to an accredited MEng degree
- **Opportunities to develop, creativity and innovative skills** through open-ended design, make and test exercises, design, individual investigative and *innovative* project work
- **Business and management** covering both operational and strategic issues
- **Ability and confidence to take on leadership in major engineering projects** through studies in law, languages and other complementary studies as well as active participation in team exercises

Appendix 3 summarises the differences between a BEng (Hons) and MEng degree accredited for CEng and a Bachelor degree accredited for IEng. The QAA qualifications descriptors for honours and masters degrees articulate clearly the differences between qualification levels, complementing the statements above.

## 7. MEng Degrees

The accredited MEng degree is an alternative route to completing the educational base for registration as a Chartered Engineer. It should provide a platform for well-motivated students with high potential to pursue successful careers progressing to senior positions, with responsibilities ranging from technical specialist to engineering generalist. Therefore, the IMechE will accredit a broad range of MEng degrees designed to support the development of Chartered Engineers for a wide range of career paths within Mechanical Engineering, please refer to appendix 6 for an indicative list of degrees that the IMechE will consider for accreditation.

The learning outcomes of the MEng degree are those appropriate to an integrated Masters degree within the Quality Assurance Agency for Higher Education (QAA) Framework and as a second-cycle degree as defined by the Bologna Agreement. It is a four-year full-time (or equivalent) first degree and is a broad-based, integrated programme of learning that should take place in a well resourced and managed environment dedicated to engineering education. Compared with the BEng (Hons) degree accredited for CEng, the MEng degree is broader in scope and will cover strategic management and leadership issues.

### *7.1 Output*

MEng graduates should have the versatility and depth of understanding to enable them to deal with new and unusual challenges in their chosen field of engineering. They should be imaginative and creative so that they can become innovators. MEng graduates must be

equipped to progress rapidly to a position of responsibility and provide technical, managerial, and entrepreneurial leadership in specialist or inter-disciplinary projects.

Appendix 2 contains further detail about accredited degree outputs.

*7.2 A Broad Education Developing Versatility*

The first two years of the MEng degree should provide a broad foundation in Mechanical Engineering appropriate to the aims, objectives and learning outcomes of the degree. The MEng graduate requires a foundation that covers the broad spectrum of engineering and this requires study beyond the intended area of specialisation. Unified and Joint Honours degrees can more easily achieve breadth where this has always been a central theme. Degrees with a narrow subject focus, e.g. Acoustics Engineering, need to provide an awareness of subjects beyond the degree specialisation. The selection of subjects should be coherent and cohesive to support the learning outcomes of the degree while avoiding a non-coherent 'pick and mix' approach.

*7.3 Depth of Understanding*

In the final two years, the studies should include a thorough treatment of a coherent selection of subjects in support of the degree specialisation. Studies usually, but not exclusively, in the final year of an MEng degree should be more advanced (although other material may be included) and provide greater challenge to achieve a greater depth of understanding than the specialist subjects in a BEng (Hons) degree accredited for CEng. IMechE recognises that some elements of the MEng degree may be common with a parallel stream of a BEng (Hons) degree accredited for CEng.

*7.4 Creativity and Innovation*

The methods by which these attributes are usually developed are the same as those for the BEng (Hons) accredited for CEng, plus a group design or investigative project, normally undertaken in the final year, requiring reference to and integration of the degree subject(s) with other areas of engineering

*7.5 Subjects Studied*

Each degree should have its own particular emphasis and characteristics, clearly articulated in its aims, objectives and learning outcomes; the subjects studied during the degree (see Appendix 1) should support these in a progressive manner.

## 8. How does the MEng degree differ from the BEng (Hons) degree accredited for CEng?

The MEng degree should provide graduates with an educational base that enables them to move quickly towards becoming a Chartered Engineer through the acquisition of awareness, knowledge, understanding and skills. Therefore, compared with a BEng (Hons) degree

accredited for CEng in the same subject area, the MEng degree should normally provide students with:

- **A broader education in engineering**, with greater breadth than is provided in a single discipline engineering degree, which implies studies outside the chosen area of specialisation
- **Greater versatility** through cross-disciplinary integration of the technical courses, notably through the group project
- **Greater depth of understanding** in the chosen area of specialisation with the specialist studies being taken through to MEng level
- **Further opportunities to develop, creativity and innovative skills** through a group design and / or investigative project
- **An enhanced treatment of business and management** covering both operational and strategic issues
- **Greater ability and confidence to take on leadership in major engineering projects** through further studies in law, languages and European studies as well as active participation in team exercises

Appendix 3 summarises the differences between MEng, BEng (Hons) degree accredited for CEng and Bachelor degree accredited for IEng degrees. The QAA qualifications descriptors for honours and masters degrees articulate clearly the differences between the two qualification levels, complementing the statements above. It should be noted that, under the QAA's Higher Education Qualifications Framework for England, Wales and Northern Ireland and for Scotland, MEng degrees will need to demonstrate that they meet the Masters level descriptors.[6] to satisfy the educational base for CEng registration.

Some students may choose to study a BEng (Hons) degree accredited for CEng that matches their intended field of specialisation, and follow this with a period of appropriate further learning.

## 9. Further Learning

*Further Learning is the knowledge and understanding that underpins Initial Professional Development and the emphasis in any further learning activity must be on what someone is learning or has learnt. A period of further learning is required for individuals who have not satisfied the educational base for IEng or CEng through an accredited degree at the appropriate level.*

### *9.1 To complete the educational base for Incorporated Engineer*

Applicants with a suitable Higher National Diploma or Certificate or Foundation Degree will need to complete the educational base requirements for Incorporated Engineer status by undertaking an appropriate period of further learning to degree level. The required content for a specific candidate will depend on the depth and breadth of the particular HND. In defining this content, it is expected that all candidates will need to consider each of the following elements:

6 The MEng will include some material at Masters level.

- the amount of specialist knowledge undertaken
- the breadth of education, particularly in non-technical areas and in the integration of technical studies
- the need for industrial involvement.

Accredited Postgraduate Diplomas secured as a result of study on an accredited Masters Degree will also meet the requirements. (see 9.2.1 below)

*9.2 To complete the educational base for Chartered Engineer*

Graduates from a BEng (Hons) degree accredited for CEng will need to complete the educational base requirements for Chartered Engineer status by undertaking either an appropriate accredited Masters degree or a period of further learning to Masters level to provide:

9.2.1 Masters Degrees
The IMECHE will consider for accreditation Masters degrees meeting QAA level criteria with an engineering content that will provide a suitable learning experience for an applicant wishing to register with the ECuk through the IMechE

9.2.2 Programmes of Further Learning

Programmes of Further Learning may be submitted for approval; by individuals or by organisations, particularly in association with accredited MPD Schemes. The programme should be designed as a flexible concurrent enhancement to the programme of Initial Professional Development. Programmes of formal study may be appropriate but ones that combine formal study with work based learning may be equally appropriate especially when combined with a programme with the MPDS.

Knowledge and understanding to masters level must be secured and three areas must be evident:
- Engineering and science deepening
- Technical broadening
- Non-technical broadening

Further learning should be flexible therefore, the IMechE does not prescribe the topics to be covered in further learning schemes or individual plans, the experiences of every engineer are different and what they need to learn and understand will be determined by their own career aspirations and the industry in which they work.

*9.3 Further Learning for moving between Chartered Engineer and Incorporated Engineer*

Graduates with a bachelor degree accredited for IEng and who wish to register for CEng will need to complete Further Learning that *also* develops the analytical skills inherent within the BEng (Hons) degree accredited for CEng. Similarly, graduates with a BEng (Hons) degree accredited for CEng and who wish to register for IEng will need to complete Further Learning that *also* develops the applications skills inherent within the bachelor degree accredited for IEng.

*9.4 Further information*

Further information about Further Learning can be found in the relevant IMechE guidance paper

(please use the contact details on page 21 of this document to request a copy).

## 10. Degree Accreditation

### *10.1 Introduction*

Accreditation is the process used by the Engineering Institutions, under licence from the Engineering Council (UK), to assure the suitability of educational programmes designed as the preferred route into the engineering profession. Other routes to Institution membership and registration with the Engineering Council (UK) are available, although these all require applicants to be individually assessed. Accreditation involves a periodic quality assessment and audit of the particular degree against agreed criteria. It is a peer review process, undertaken by panels comprising professional engineers from industry and academia, supported by Institution staff. The process involves scrutiny of relevant data about the degree(s), the academic department and its resources, and a structured visit to the educational institution.

From September 2004, the accreditation process will focus on output standards (learning outcomes). Output Standards Matrix Forms will be required for each course of study. The completed form will provide a framework for the assessment of output standards by IMechE teams during an accreditation visit. Also, evidence must be provided to show that the standards set by the course provider have been achieved by the students who have successfully completed the course of study.

Aims, objectives and learning outcomes should state whether the degree is designed to meet the needs of Chartered or Incorporated Engineers, its particular emphasis and characteristics and whether it has been designed to meet UK-SPEC and IMechE requirements. These statements are, therefore, key accreditation documents and IMechE accreditation panels will pay them close attention. QAA's *Guidelines for preparing programme specifications* may be found useful by those preparing aims, objectives and learning outcome statements.[7]

### *10.2 Joint accreditation by IMechE and other Engineering Institutions*

Some degrees may be appropriate for accreditation by both the IMechE and another Institution (e.g. IEE, RAeS, IMarEST and IIE). Where joint accreditation visits are arranged the parties involved will need to agree which of the Institutions will act as the lead Institution. Departments interested in a joint visit should contact all Institutions from whom accreditation is sought to discuss visit plans well in advance of the proposed date of the event.

It should be noted that while Institutions will arrange for joint accreditation processing (including the majority of paperwork) and visits, decisions are made independently and thus outcomes may vary between Institutions.

### *10.3 Promoting professionalism*

The Institution believes that all engineers should demonstrate and maintain high professional standards in the conduct of their work. This applies equally to teaching staff, as part of their own professional commitment as well as an example to students. Membership of a relevant

7 http://www.qaa.ac.uk/crntwork/progspec/progspec0600.pdf

professional body would be one sign of such a commitment and the IMechE would expect to see that the majority of staff delivering accredited degrees are professionally registered. It is also expected that the teaching staff will actively promote the concept of professionalism (demonstrated by Institution membership and, eventually, registration) through presentations and guidance to students.

### *10.4 Applications and outcomes of accreditation*

Accreditation is an involved process that can take up to 9 months from providing the completed application forms, plus supporting material, to receiving the outcome decision. Application for accreditation of a degree, or suite of degrees, will only be accepted on the appropriate application forms, which are available electronically from the IMechE[8] or in print from the address on page 21 of this document. From time to time changes are made to the application forms and so it is recommended that a new copy be obtained before each application.

It should be noted that degrees will be accredited for either CEng or IEng, not both.

The maximum period of accreditation awarded is five years. A shorter period of accreditation may be granted if the degree is new, if there are concerns about its operation, or uncertainties about its future. Applications for accreditation will result in one of the following outcomes:

- Accredited: for a period not exceeding five years, either with or without conditions and / or recommendations
- Not accredited

Lists of accredited degrees will be published on the IMechE website for use by, among others, prospective students and employers. If a degree is not accredited, the University making the application may ask for the matter to go to arbitration or, failing a satisfactory result, to appeal. The appeals procedure is described in Appendix 4.

### *10.5 Costs of accreditation*

There is normally no charge for accrediting degrees at Universities in the UK. Where accreditation is conducted outside the UK the University seeking accreditation will be expected to cover all costs for the visiting team.

### *10.6 Confidentiality of information*

The Institution treats all information it receives in respect of the accreditation process as confidential. Papers provided by Universities, reports, or minutes of meetings will only be shown to those involved in the accreditation process (including during arbitration and appeals).

8 http://www.imeche.org.uk/profdev/pdf/educational_base.pdf

### *10.7 Subject Benchmarking*

The Institution supports the work of the QAA and the Engineering Professors' Council to produce useable and relevant output standards for engineering degrees. ECuk has used the work by these two bodies in the production of the learning outcomes statements that accompany any UK SPEC. As required by the terms of its license with the ECuk the IMechE has interpreted these statements for the engineering disciplines within its sphere of influence and these are included in Appendix 2

### *10.8 Good Practices in the Conduct of Accreditation*

Clear and open communications are essential if the potential benefits of accreditation are to be fully realised and the process is to operate smoothly. To assist this, IMechE has developed a framework of responsibilities for the parties involved in accreditation, see Appendix 5.

### *10.9 Start Year*

The 'start year' for any degree will be deemed to be the year when the degree began for the normal cohort, who were starting at year 1 of the degree. That 'start year' applies irrespective of whether some individuals start a year earlier (e.g. on a 'Year Zero' or Foundation Course) or a year later (in recognition of advanced standing).

## 11. Accreditation Guidance and Criteria

The following is intended as guidance on key accreditation issues that will be helpful for those designing a degree for which accreditation is sought: it should not be viewed as an exhaustive list of the accreditation criteria.

### *11.1 Industrial Involvement*

It is essential to provide mechanisms that allow the range of modern engineering practices in industry and commerce to influence the degree content and student learning process. This can be achieved through a variety of complementary means (e.g. Industrial Advisory Committee, industrial visits, student placements, visiting lecturers, projects, and staff industrial secondments). Evidence will be required to show that industrial involvement is an integral and ongoing part of the degree.

### *11.2 Acceptable entry qualifications and levels of achievement*

UK-SPEC no longer specifies that a set proportion of each entry cohort needs to have a particular level of attainment in A level or other qualifications. The IMechE recognises that students are admitted to degrees with a wide range of qualifications, including non-UK qualifications.

Therefore, entry to the programme and how the cohort entry extremes will be supported will continue to be examined as part of the overall accreditation decision making process.

It should be remembered that the aim is to ensure that each cohort has the appropriate intellectual potential to succeed on the degree and pursue a career as a professional engineer.

Students intending to study for an engineering degree will be advised that the preferred subject profile is:

| Bachelor degree accredited for IEng | BEng (Hons) degree accredited for CEng | MEng |
|---|---|---|
| Physics, another science-based subject or a design and technology qualification with a strong engineering bias. | Preferably physics, or alternatively another science-based subject or a design and technology qualification with a strong engineering bias. | |
| Mathematics is recommended but not essential | Mathematics, as an essential foundation for analysis and modelling | |
| A further science-based subject or one chosen from the **arts or sciences**, other than General Studies, to provide breadth. | A further science-based subject or one chosen from the **arts or sciences**, other than General Studies, to provide breadth. | |

### *11.3 Foundation programmes or courses*

The Institution will approve foundation courses that provide a suitable entry route to accredited BEng (Hons) degrees for students with an inappropriate qualification profile. Students on an approved foundation programme will be considered to have achieved an acceptable entry standard of CCC's at A'Level or equivalent if they satisfy the following:-

- **For BEng (Hons) degree accredited for CEng** - overall aggregate pass mark of at least 55%, with at least 55% in mathematics and engineering mechanics (or the equivalent physical science) and at an aggregate of least 40% in all other subjects
- **For Bachelor degree accredited for IEng** - overall aggregate pass mark of at least 40%

### *11.4 Direct Entry*

Entry directly into year 3 of a BEng (Hons) degree accredited for CEng or year 4 of an accredited MEng degree should not normally be permitted. Direct entry to the third year of a bachelor's degree accredited for IEng is permitted in the case of students who have completed an approved HND. In respect of all accredited degrees, direct entrants[9] should not make up more than 30% of the students in that year.

### *11.5 Student assessment*

In accrediting a degree, the IMechE accepts that the Board of Examiners will determine which

9 *Direct entrants are those students admitted to the degree without having first completed any preceding year or years.*

students have achieved the standard required for the award of the degree. Therefore, the accreditation team will look closely at the assessment arrangements and practices to assure their rigour and that they are appropriate to the learning outcomes (see paragraph 4.1).

External Examiners' reports are part of the documentation submitted by a department when seeking degree accreditation. It is expected that the emphasis in examinations and other forms of assessment should change during the degree. Early on, it may involve testing skills and knowledge. Later it should involve testing understanding through the application of engineering principles to realistic engineering problems.

All examination papers should consist of previously unseen questions and students should not be "coached" to answer the specific set of questions that will appear on the examination paper. A resit examination must consist of a new set of previously unseen questions and the resit examination must have the same duration and be taken under the same conditions as the original examination.

An oral examination is ideal for assessing the investigative project and design work in the latter part of the degree and permits detailed testing of understanding. An oral presentation to academic staff and other student's tests communication skills, while an individual oral examination by two or three examiners permits a thorough assessment of understanding.

Major projects within accredited degrees must normally be successfully completed at the first attempt and must make a major contribution to the final assessment.

Differences in initial student preparation and rate of development mean that transfer between degrees accredited for CEng may be appropriate. Transfers between degrees accredited for IEng and CEng may also be appropriate in exceptional circumstances and when students are deemed able to adapt to the different style and emphasis of the receiving degree. The degree structures set out in this paper allow for such transfers. The accreditation team will look closely at the examinations on which any such transfers are based.

### *11.6 Laboratory Work and Engineering Applications*

Appropriate laboratory work should be evident throughout the entire degree programme to complement the subjects studied and provide the vehicle for exploring the relationship between conceptual models and real engineering systems. In addition, Engineering Applications should provide hands-on experience of the behaviour of materials and processes, the relationships between design, materials and manufacture, and an appreciation of the human skills needed in manufacture.

### *11.7 Individual project*

All degrees accredited by the IMechE include an individual project. This may be a "linked" exercise but individual input is essential and must be clearly identifiable as such and assessable independently. The project should form a major part of the final year of a degree and contribute between 15 and 25% of the available marks for the final year. If a degree is awarded to a student who fails the individual project that graduate's degree will not be recognised as being accredited.

The project should be of a technical nature and support the engineering orientation of the degree as a whole. It should not simply be a computer exercise, a non-technical assignment or a review (although a review will normally be part of the project). An integrated exercise involving a technical investigation which incorporates a financial appreciation is encouraged.

Although some projects may not contain all the following elements, the ideal project should involve:

- reference to any relevant previous work
- appropriate analysis
- appropriate design
- manufacture (if practical)
- testing and interpretation of results
- preparation of a final report including costing aspects and clear recommendations

### *11.8 Group project*

The final year of a bachelor degree accredited for IEng will normally include a major design or investigative group project, requiring reference to and integration of the subjects within the degree.

The final year of an MEng degree will normally include a group design or investigative project, requiring reference to and integration of the engineering and non-technical subjects that distinguish the MEng group project from a BEng (Hons) project. The project should form a major part of the MEng degree and contribute to the Masters level outcomes.

### *11.9 Examination Papers*

Examination papers must be original and previously 'unseen' by the students. There should be no coaching of undergraduates for any examinations. The accreditation team will review examination papers, tutorial questions, exercise sheets and similar material.

Papers will be reviewed for academic rigour and challenge. Examinations in both technical and non-technical subjects must test *understanding and applications*, appropriate to the CEng or IEng ethos of the degree, rather than simply recall, particularly at the later stages of the degree. Questions should enable the candidate to demonstrate his/her ability to use a logical approach when obtaining a solution.

IMechE's accreditation team will look for additional, more demanding 'open-ended' elements to some questions that allow the more able candidates to demonstrate their higher level of understanding.

Examination papers, particularly in the later stages of the course, should test the application of engineering theory to the solution of real engineering problems. For technical subjects the following 'ideal' structure has been proposed:

- the 'real world' problem should be clearly stated
- the candidate should decide upon the physical model which best describes the problem
- the most appropriate mathematical model should be established (particularly important within degrees intended for CEng-related accreditation)
- a solution should be found using data given in the question or using estimated data where appropriate
- the reliability of the answer should be assessed, taking into account the modelling approach used
- an 'open-ended' element that challenges the most able students should round off the question
- non-technical subjects should test students' understanding of issues in an engineering context or environment. 'Open book' examinations, particularly in the Final Year, should be

encouraged

The IMechE does not expect to see tutorial questions previously seen by students appearing in examination papers, with no other requirement than to reiterate theory, examination notes and/or answer questions previously covered in class.

### *11.10 Study Away From the University*

IMechE accredited degrees may involve work or study abroad. However, at least two years' study including the final year, should normally be spent at the home institution. In all cases the home institution will be required to show how the curriculum, assessment methods and monitoring systems used are sufficient to ensure the overseas studies integrate with the accredited degree and meet equivalent academic standards.

### *11.11 Joint teaching*

When the structures and contents of different degrees accredited by IMechE are closely related, jointly teaching students studying for different degrees can be a useful and legitimate way of maximising resources. This may be done for individual subjects or for specific periods of study, depending on how closely the degrees are related.

Specifically, this situation may arise in respect of two or more degrees accredited for the same professional pathway (CEng or IEng), for example two BSc degrees, two BEng (Hons) degrees or two MEng degrees. It may also be appropriate to combine the first or first two years of an MEng and a BEng degree where both are accredited for CEng. Due to the different nature of degrees accredited for IEng and those accredited for CEng it will not be common for joint teaching to take place for IEng and CEng students. Where the university believes this is justified, they will need to demonstrate how this can be done without undermining the different nature of learning experience and outcomes.

Although joint teaching may allow the maximisation of university resources, the quality of student learning experience must be maintained.

## 12. Accreditation and students with special needs

IMechE is sympathetic to submissions from universities making provision for students with special needs and recognises the need for universities to comply with current disability legislation.

## 13. Further Information

IMechE publishes guidance for those involved in the professional development of its members, initially leading to Chartered Engineer status and, thereafter, for career development. The following documents are currently available:

Academic and Professional Development Accreditation

*Educational Base and Criteria for Degree Accreditation* www.imeche.org.uk/profdev

*Further Learning Guidance* www.imeche.org.uk/membership/further_learning.asp
*Initial Professional Development* www.thempds.org.uk
*Monitored Professional Development Scheme* www.thempds.org.uk
*A Guide to Mentoring* www.thempds.org.uk

The Professional Review

*Guidance Notes for Applicants for Corporate Membership*
www.imeche.org.uk/membership

Continuing Professional Development

*Publications are downloadable from the Professional Development Partnership website*
www.pd-how2.org

Copies of *Educational Base and Criteria for Degree Accreditation* are available from the address below or downloaded from www.imeche.org.uk/profdev

Further advice about the requirements for accreditation is available by contacting the IMechE at:

Membership, Accreditation & Professional Development
Institution of Mechanical Engineers
1 Birdcage Walk
London
SW1H 9JJ

Tel: +44 (0) 20 7304 6866 or (0) 20 7973 1263
Fax: +44 (0) 20 7233 1654
Email: degreeaccreditation@imeche.org.uk

**Appendix 1 to**
**Educational Base and Criteria for Accreditation**

## 1. Subject Coverage and Balance in Accredited Degrees (see also main text paragraph 4.1)

### *1.1 Engineering Science*

An understanding of engineering science is essential in the academic element of a mechanical engineer's formation. Therefore, degrees must include an appropriate amount of the relevant physical, chemical or biological sciences including mechanics, taught from an engineering perspective.

### *1.2 Mathematics*

All degrees accredited by IMechE must contain mathematics, modelling and statistics appropriate to the subject and type of degree. Note that the mathematics needs of Chartered and Incorporated Engineers are different and should be tailored to support the distinctive nature of the degree programme. It is, for example, expected that all degrees accredited for CEng will contain extensive modelling of complex engineering situations from 'first principles'.

The Mathematics content should be embedded within and throughout the whole degree programme. During the first year the mathematics content should meet the needs of the whole peer group and allow for the variation in mathematics knowledge possessed by the cohort at entry.

### *1.3 Engineering Subjects*

The number, combination and level of engineering subjects relevant to the degree title is not specified. Degrees must contain a balanced content in support of the aims, objectives and learning outcomes while providing students with an understanding of mechanical engineering and its applications, in the broadest sense. The degree must, however, include an introduction to:

- the selection of materials and methods of manufacture
- the relationship between design, materials and manufacture
- an appreciation of the human skills required in the total engineering and all design process for CEng, and for specific elements of the process for IEng

The study of engineering science and other engineering subjects must integrate well with laboratory experiments, simulation, hands-on experience and project work.

### *1.4 Essential integrating themes and subjects*

Must include

- design as an integrating theme: within MEng degrees accredited for CEng, this should ideally lead to a large scale multi-disciplinary group design project in the third or fourth year
- an individual, or linked investigative project with individual assessment
- business and management covering the organisation of industry, project management, finance and human behaviour. The combination of these subjects will be appropriate to the aims of the degree and whether it is intended as preparation for future IEng or CEng professionals
- health and safety legislation and risk management

### *1.5 Environment and Sustainability*

Environmental issues and sustainability considerations should be incorporated into all engineering degrees. They need not be taught as separate subjects but should be an integral part of the course theme and structure. Design & Project work should, in particular, include an appreciation and understanding of these important issues as they impinge upon the matters in hand.

### *1.6 Complementary and transferable skills*

All accredited courses should develop transferable skills such as team-working, communications and presentation skills. Opportunities to develop complementary skills such as languages and additional computing skills are encouraged.

## 2. Degree Output Standards

The Output statements set out below are the interpretation by the IMechE of those published by ECuk in its document "The Accreditation of Higher Educations Programmes – May 2004". Within this document the following terms are used with the meanings stated:
"Understanding" is the capacity to use concepts creatively, for example, in problem solving, in design, in explanations and in diagnosis
"Knowledge" is information that can be recalled.
"Know-how" is the ability to apply learned knowledge and skills to perform operations intuitively, efficiently and correctly.
"Skills" are acquired and learned attributes which can be applied almost automatically.
"Awareness" is general familiarity, albeit bounded by the needs of the specific discipline.

### 2.1 General Learning Outcomes

Graduates with the exemplifying qualifications, irrespective of registration category or qualification level, must satisfy the following criteria:

| IEng degree | BEng(Hons) for CEng | Integrated MEng degree |
|---|---|---|
| • Place an emphasis on the application of developed technology and the attainment of know-how, sometimes within a multidisciplinary engineering environment. The breadth and depth of underpinning scientific and mathematical knowledge, understanding and skills is provided in the most appropriate manner to enable the application of engineering principles within existing technology to future engineering problems and processes. | • To be accredited, engineering programmes must provide two different categories of learning outcomes. One category will be general in nature, and will apply to all types of programme. The second category will be more specific. These two categories of outcome will be inter-related, with the general learning outcomes being embodied to a greater or lesser extend within the various engineering learning outcomes. | • MEng degrees differ from CEng Bachelors degrees in having a greater range of project work, including a group project. They also provide a greater range and depth of specialist knowledge, within a research and industrial environment, as well as a broader and more general educational base, to provide both a foundation for leadership, and a wider appreciation of the economic, social and environmental context of engineering. |
| • A programme accredited for IEng will have the general learning outcomes described earlier in this document. IEng programmes will have an emphasis on developing and supporting the know-how necessary to apply technology to engineering problems and processes, and to maintain and manage current technology at peak efficiency. | | • The range of general learning outcomes described for graduates from Bachelors programmes will also apply to graduates from MEng programmes. Graduates from an accredited integrated MEng degree will have the ability to integrate their knowledge and understanding of mathematics, science, ICT, design, the economic, social and environmental context and engineering practice to solve a substantial range of engineering problems, some of a complex nature. They will have acquired much of this ability through involvement in individual and group design projects, which have a greater degree of industrial involvement than those in Bachelors degree programmes. |

### *Knowledge and Understanding*

| IEng degree | BEng(Hons) for CEng | Integrated MEng degree |
|---|---|---|
| • underpinning scientific and mathematical knowledge and understanding to enable the application of engineering principles within existing technology to future engineering problems and processes | • must be able to demonstrate their knowledge and understanding of essential facts, concepts, theories and principles of their engineering discipline, and its underpinning science and mathematics | • the ability to learn new theories, concepts, methods etc in unfamiliar situations |
| | • must have an appreciation of the wider multidisciplinary engineering context and its underlying principles | |
| | • must appreciate the social, environmental, ethical, economic and commercial considerations affecting the exercise of their engineering judgement | |

### *Intellectual Abilities*

| IEng degree | BEng(Hons) for CEng | Integrated MEng degree |
|---|---|---|
| • to support know-how when applying technology to future engineering problems and processes | • must be able to apply appropriate quantitative science and engineering tools to the analysis of problems | • the ability to develop, monitor and update a plan, to reflect a changing operating environment |
| | • must be able to demonstrate creative and innovative ability in the synthesis of solutions and in formulating design | |
| | • must be able to comprehend the broad picture and thus work with an appropriate level of detail | |

### *Practical Skills*

| IEng degree | BEng(Hons) for CEng | Integrated MEng degree |
|---|---|---|
| • application of engineering principles within existing technology to future engineering problems and processes | • must possess practical engineering skills acquired through, for example, work carried out in laboratories and workshops, in industry through supervised work experience, in individual and group project work, in design work and in the development and use of computer software in design, analysis and control | |
| | • evidence of group working and participation in a major project are expected | • an understanding of different roles within a team, and the ability to exercise leadership |

### *General Transferable Skills*

| IEng degree | BEng(Hons) for CEng | Integrated MEng degree |
|---|---|---|
| | • must have developed transferable skills that will be of value in a wide range of situations | |
| | • exemplified by the QCA 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 | |
| | • also include planning self-learning and improving performance, as the foundation for lifelong learning/CPD | • the ability to monitor and adjust a personal programme of work on an ongoing basis, and to learn independently |

## 2.2 Specific Learning Outcomes

Graduates from accredited programmes must achieve the following five learning outcomes, defined by broad areas of learning. The learning outcomes are expressed in terms of underpinning science and mathematics, engineering analysis, design, economic, social and environmental context and engineering practice
In the table below, the central column related to the BEng (Hons) for CEng, is the reference column and the ones to the left and right show enhancements or limitations to it. Where no enhancement or limitation is shown the statement in the central column applies.

| | **IEng degree as enhancement or limitation to BEng (Hons) for CEng** | | **BEng (Hons) for CEng** | | **Integrated MEng degree as, enhancement of BEng Hons** |
|---|---|---|---|---|---|
| | ***The weighting given to these different broad areas of learning will vary according to the nature and aims of each programme*** | | | | |
| | ***Underpinning science and mathematics, and associated engineering disciplines (US)*** | | | | |
| **US1i** | • Knowledge and understanding of the scientific principles underpinning relevant technologies. | **US1** | • 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. | **US1m** | • A comprehensive understanding of the scientific principles of mechanical and related engineering disciplines |
| **US2i** | • Knowledge and understanding of mathematics necessary to support application of key engineering principles | **US2** | • 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 | **US2m** | • A comprehensive knowledge and understanding of mathematical models relevant to the mechanical and related engineering disciplines, and an appreciation of their limitations; |
| **US3** | | **US3** | Ability to apply and integrate knowledge and understanding of other engineering disciplines to support study mechanical and related engineering disciplines | **US3m** | • An understanding of concepts from a range of areas including some outside engineering, and the ability to apply them effectively in engineering projects |
| | | | | **US4m** | • A comprehensive knowledge and understanding of the role and limitations of ICT, and an awareness of developing technologies in ICT; |

| | IEng degree | | BEng (Hons) for CEng | | Integrated MEng degree |
|---|---|---|---|---|---|
| | ***Engineering Analysis (E)*** | | | | |
| **E1i** | • Ability to monitor, interpret and apply the results of analyses and modelling in order to bring about continuous improvement | **E1** | • Understanding of engineering principles and the ability to apply them to analyse key engineering processes | **E1m** | • Ability to use fundamental knowledge to investigate new and emerging technologies |
| **E2i** | • Ability to use the results of analysis to solve engineering problems, apply technology and implement engineering processes. | **E2** | • Ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques | **E2m** | • Ability to extract data pertinent to an unfamiliar problem, and apply in its solution using computer based engineering tools when appropriate; |
| **E3i** | • Ability to apply quantitative methods and computer software relevant to mechanical engineering technology, frequently within a multidisciplinary context. | **E3** | • Ability to apply quantitative methods and computer software relevant to mechanical and related engineering disciplines, to solve engineering problems | **E3m** | • An understanding of the capabilities of computer based models for solving problems in engineering, and the ability to assess the limitations of particular cases; |
| **E4i** | • Ability to apply a systems approach to engineering problems through know-how of the application of the relevant technologies. | **E4** | • Understanding of and ability to apply a systems approach to engineering problems | **E4** | |
| | **Design is the creation and development of an economically viable product, process or system to meet a defined need. It involves significant technical and intellectual challenges and can be used to integrate all engineering understanding, knowledge and skills to the solution of real problems. Graduates need the knowledge, understanding and skills to:** | | | | |
| | ***Design (D)*** | | | | |
| **D1i** | • Define a problem and identify constraints. | **D1** | • Investigate and define a problem and identify constraints including environmental and sustainability limitations, health and safety and risk assessment issues | **D1m** | • Wide knowledge and comprehensive understanding of design processes and methodologies and the ability to apply and adapt them in unfamiliar situations |
| **D2i** | • Design solutions according to customer and user needs. | **D2** | • Understand customer and user needs and the importance of considerations such as aesthetics | **D2** | |

| | | | | | |
|---|---|---|---|---|---|
| **D3** | | **D3** | • Identify and manage cost drivers | **D3** | |

| | **IEng degree** | | **BEng (Hons) for CEng** | | **Integrated MEng degree** |
|---|---|---|---|---|---|
| **D4i** | • Use practical creativity and innovation | **D4** | • Use creativity to establish innovative solutions. | **D4m** | • Ability to generate an innovative design for systems, components or processes to fulfil new needs |
| **D5i** | • Ensure fitness for purpose (including operation, maintenance, reliability etc). | **D5** | • Ensure fitness for purpose for all aspects of the problem including production, operation, maintenance and disposal | **D5m** | • Ability to generate ideas for new products and develop and evaluate a range of new solutions |
| **D6i** | • Adapt designs to meet their new purposes or applications. | **D6** | • Manage the design process and evaluate outcomes | **D6** | |
| ***Economic, social and environmental context (S)*** | | | | | |
| **S1i** | • Knowledge and understanding of commercial and economic context of engineering processes. | **S1** | • Knowledge and understanding of commercial and economic context of engineering processes. | **S1m** | • The ability to make general evaluations of commercial risks through some understanding of the basis of such risks |
| **S2i** | • Knowledge of management techniques which may be used to achieve engineering objectives within that context | **S2** | • Knowledge of management techniques which may be used to achieve engineering objectives within that context | **S2m** | • Extensive knowledge and understanding of management and business practices, and their limitations, and how these may be applied appropriately *to strategic and tactical issues.* |
| **S3i** | • Understanding of the requirement for engineering activities to promote sustainable development | **S3** | • Understanding of the requirement for engineering activities to promote sustainable development | **S3** | |
| **S4i** | • Awareness of the framework of relevant legal requirements governing engineering activities, including personnel, health, safety, and risk (including environmental risk) issues | **S4** | • Awareness of the framework of relevant legal requirements governing engineering activities, including personnel, health, safety, and risk (including environmental risk) issues | **S4** | |
| **S5i** | • Understanding of the need for a high level of professional and ethical conduct in engineering | **S5** | • Understanding of the need for a high level of professional and ethical conduct in engineering | **S5** | |

| | IEng degree | | BEng (Hons) for CEng | | Integrated MEng degree |
|---|---|---|---|---|---|
| ***Engineering Practice (P)*** | | | | | |
| **P1i** | • Understanding of and ability to use relevant equipment, tools, processes, or products. | **P1** | • Knowledge of characteristics of particular equipment, processes, or products | **P1m** | • A thorough understanding of current practice and its limitations, and some appreciation of likely new developments |
| **P2i** | • Knowledge and understanding of engineering workshop and laboratory practice | **P2** | • Engineering workshop and laboratory skills | **P2m** | • Extensive knowledge and understanding of a wide range of engineering materials and components |
| **P3i** | • Knowledge of contexts in which engineering knowledge can be applied (e.g. operations and management, technology development, technology application etc). | **P3** | • Understanding of contexts in which engineering knowledge can be applied (e.g. operations and management, technology development, etc) | **P3** | |
| **P4i** | • Ability to use and apply information from technical literature. | **P4** | • Understanding use of technical literature and other information sources | **P4** | |
| **P5** | | **P5** | • Awareness of nature of intellectual property and contractual issues | **P5** | |
| **P6i** | • Ability to use appropriate codes of practice and industry standards. | **P6** | • Understanding of appropriate codes of practice and industry standards | **P6** | |
| **P7i** | • Awareness of quality issues and their application to continuous improvement. | **P7** | • Awareness of quality issues | **P7** | |
| **P8i** | • Understanding of the principles of managing engineering processes. | **P8** | • Ability to work with technical uncertainty | **P8m** | • Ability to apply engineering techniques taking account of a range of commercial and industrial constraints |

**Appendix 3 to**
**Educational Base and Criteria for Accreditation**

## CHARACTERISTICS OF ENGINEERING DEGREES

| | Bachelor degree accredited for IEng | BEng (Hons) degree accredited for CEng | MEng Degree |
|---|---|---|---|
| **Breadth and Depth** | Includes a basis of appropriate engineering science plus a relevant selection of engineering subjects in support of the degree title. | Includes a basis of appropriate engineering science plus engineering subjects in support of the degree title with some broadening subjects and greater depth. | Includes a basis of appropriate engineering science plus engineering subjects in support of the degree title to a greater depth, in-depth technical applications and broadening in technical and non-technical subject areas. |
| **Versatility** | Creates ability to practise within a broad range of Mechanical Engineering and within current practice. | Creates ability to practise freely across Mechanical Engineering in developing new technologies. | Creates ability to practise freely across Mechanical Engineering and also take a leadership role. |
| **Understanding** | Study will create understanding of a coherent selection of relevant subjects. May include some study appropriate to BEng (Hons) degree accredited for CEng. | Study will create understanding of a coherent selection of relevant subjects. May include some study appropriate to MEng degree. | Study will create understanding of a coherent selection of relevant subjects at BEng (Hons) level with some taken further to MEng level. |
| **Imagination, Creativity & Innovation** | Will be developed through open-ended design-make-test exercises, design and individual investigative project work. | Will be developed through open-ended design-make-test exercises, design, individual investigative and innovative project work. | Will be developed through open ended design-make-test exercises and design and project work including group interdisciplinary project(s). |
| **Leadership** | Non-technical and business studies to prepare graduates for a career as a top class applications engineer exercising independent judgement within a chosen area of expertise. | Non-technical and business studies to prepare graduates for a career as a top class innovative engineer exercising technical and managerial leadership. | Non-technical and business studies to prepare graduates for a career as a top class innovative engineer exercising technical and managerial leadership at a senior level that may be cross-disciplinary. |

## Degree Accreditation Appeals Procedure

### 1. Introduction

This document sets out the policy for dealing with appeals from a Higher Education Institute (HEI) following a degree accreditation decision made by the Academic Standards Committee (ASC). Any HEI that which has a submission for accreditation turned down may appeal in accordance with the procedures contained in this document.

### 2. Grounds For Appeal

An appeal may only be made on one or more of the following grounds:

2.1 Existing information that could have influenced an accreditation decision, and which due to circumstances outside the Department's control could not be presented, has subsequently become available.

2.2 Facts contained in the submission documentation that might affect the accreditation decision have not been taken into account.

2.3 Evidence exists of administrative, procedural or other irregularity in the conduct of the visit or the meeting of the ASC at which the decision was reached.

### 3. Initial Action

An HEI that wishes to appeal against a decision must write to the Institution within 30 days of receipt of the decision. The Secretary of the ASC shall establish the facts with the relevant ASC members and resolve any factual misunderstandings that exist. If the HEI then accepts the decision the matter will be ended. If the HEI is not satisfied with the decision or it is found that there are grounds for an appeal the matter will be brought before the next ASC meeting for re-consideration. The HEI will be informed of the outcome, in writing, within five working days of the meeting.

If the HEI does not accept the subsequent decision it may lodge an appeal, in writing, with the Institution within 90 days of the date on the letter informing it of the decision. An appeal will only be accepted from the Head of Department or Faculty who has responsibility for the relevant degree subject area. Appeals must be in writing, must state the decision concerned and the grounds for the appeal and contain an appeal fee of £500 (returnable at the discretion of the Appeals Committee). Supporting documentation may be included in support of the appeal.

Normally, appeals submitted outside the specified time scales will be invalid. The appellant may withdraw the appeal at any stage by submission in writing to the Institution.

## 4. The Appeal Process

*Receipt of the Appeal.*

The Institution will acknowledge the appeal in writing within five working days of its receipt. The appeal will be considered by the Chairman of the Qualifications and Membership Board (QMB) who will decide whether there is a prima facie case for appeal. Where required further information may be sought from the appellant. If it is considered that there is a prima facie case an Appeal Committee will be convened.

### 4.1 *The Appeal Committee*

The Appeal Committee is required to examine the case and decide whether it requires the ASC to reconsider its decision. The Appeal Committee will normally meet within six weeks of the receipt of the appeal at the Institution.

Twenty working days notice of the date, time and venue of the meeting of the Appeal Committee shall be given to those required or invited to attend. Notice will be sent to the appellant by recorded delivery to the address given on the notice of appeal.

The Appeal Committee shall consist of persons who have no direct involvement with the ASC or the HEI involved. The membership will be:

- two members of the QMB nominated by the Chairman of the QMB, one nominated as Chairman
- a Member or Fellow of the IMechE who is not one of the above
- *should an additional person be nominated to replace the member of the membership committee which no longer exists*
- an external representative (e.g. representative of another engineering professional body)

A quorum of the Appeal Committee will be four members (but must include the external representative). The appointed Secretary to the Appeal Committee will have no vote and will not count as part of the quorum.

Papers for the meeting will be sent to members of the Committee and the persons required or invited to attend no later than five working days before the date of the meeting. The papers will include the appellant's letter of appeal together with any supporting documentation and information provided by the ASC concerning the original decision. Additional papers may only be tabled at the meeting with the prior approval of the Chairman of the Appeal Committee.

The HEI making the appeal must be represented at the meeting (maximum of two representatives) and must notify the Institution of the names and appointments of the persons attending. If the appellant is not represented at the meeting, the Chairman is satisfied that the notice of the meeting was duly and correctly sent and there being no extenuating circumstances the appeal will be dismissed. Normally the ASC shall be represented by the Chairman (or nominee) and another who would normally be the Chair of the team which visited that HEI.

The following procedure will normally be followed:

- preliminary private discussion by the Appeal Committee
- evidence from the appellant
- evidence from the ASC representatives
- joint question and answer session (if required)
- private deliberations by the Appeal Committee

All decisions of the Appeal Committee shall be by majority vote of the members. In the event of the vote being tied, the Chairman will have a casting vote.

The proceedings of the Appeal Committee shall be confidential to the Committee and the Secretary, except that when an appeal is upheld relevant records of the meeting will be made available to the ASC to assist their further deliberations.

4.2 *Procedure after the Appeal Committee meeting*

Once a decision has been made the ASC will be informed. If an appeal is upheld the Appeal Committee will normally require the ASC to reconsider its decision. The ASC shall consider the matter at its next scheduled meeting, giving due attention to the comments, recommendation and any other information provided by the Appeal Committee. The ASC will confirm its original decision or make such adjustments as, in the circumstances, seem just and inform the Chairman of QMB of the outcome.

Where the original decision is confirmed the Chairman of the QMB may, if in his/her opinion due and proper account has not been taken of the Appeal Committee's findings, refer the matter to the QMB. The QMB has the authority to uphold or annul the decision of the ASC.

Once the QMB has reached a decision the appellant will be informed, in writing, of the decision within five working days of the meeting. Where time delays occur because of scheduled meeting dates, the appellant will be kept informed of progress. There is no further right of appeal to the Institution and no further correspondence will be entered into regarding the appeal.

Procedure to be followed in the event of an appeal being dismissed.

If the appeal is not upheld the appellant will be informed of the outcome, in writing, within twenty working days of the meeting. There is no further right of appeal to the Institution and no further correspondence will be entered into regarding the appeal.

## 5. Confidentiality

It is a requirement of all those involved that all information relevant to the appeal be treated as confidential. Once an appeal has been accepted there should be no communication of any sort on the subject of, or subjects with a direct influence on, the appeal between interested parties and members of the Appeal Committee.

## IMechE Framework of Responsibilities in Accreditation

Clear and open communications are essential if the potential benefits of accreditation are to be fully realised and the process is to operate smoothly. To assist this, IMechE has developed the following framework of responsibilities for the parties involved in accreditation.

*IMechE's accreditation teams and staff are responsible for:*

- ensuring that the policies and procedures are promulgated widely and consistently applied
- ensuring that they are well-informed and prepared for the visit
- pursuing only data and information necessary to judge whether accreditation criteria are met
- focusing on financial and other resources only to the extent that they affect compliance with accreditation criteria
- keeping institutional executives appropriately informed at all stages of the process
- communicating consistent and accurate information at all stages of the process
- identifying and disseminating good practice while recognising the need for appropriate confidentiality
- providing opportunities for objective review and resolution of differences should any arise during the accreditation process

*Higher Education Institutions are responsible for:*

- carefully studying the relevant IMechE criteria, policies and procedures
- providing clear, accurate and complete information in applications for accreditation and all associated paperwork
- providing QAA degree programme specifications for degrees submitted for accreditation
- committing key staff (academic and administrative) to the accreditation process
- informing IMechE of the reasons why accreditation is being sought, in the context of institutional and programme aims and strategic direction
- providing constructive information in a timely manner if there are concerns or difficulties that emerge during the accreditation process

*Both parties are responsible for:*

- providing for candid and constructive evaluation of the accreditation process
- ensuring open exchange if issues and concerns are identified by any party
- encouraging flexibility, openness and co-operation in considering potentially beneficial variations of accreditation review

**Appendix 6 to**
**Educational Base and Criteria for Accreditation**

## Examples of Degrees that the IMechE will consider for Accreditation

The list is not exhaustive and there may be many others that have not been included here. It includes the range of programmes already accredited by the IMechE as well as many that have not previously been accredited by this Institution.

Environmental/Sustainable Engineering
Building Services Engineering
Energy Engineering
Materials Engineering
Medical Engineering
Biomedical and Bioengineering
Ocean and Offshore Engineering
Design Engineering, Product Design and Computer Aided Design
Sports Engineering
Food Engineering
Mechanical Engineering
Robotics and Cybernetics
Nuclear Process Engineering
Structural Engineering
Transportation Engineering
Aerospace/Aeronautical
Railway Engineering
Automotive Engineering
Nanotechnology
Micro-Electronic and Mechanical Engineering (MEMS)
Mechatronics
Manufacturing and Manufacturing Systems Engineering
Automation and Control
Mathematical Engineering
General Engineering
Integrated Engineering
Process Engineering

Many IMechE accredited degrees, or those suitable for accreditation, also have management, business, industrial experience or Language in their titles

**Appendix 7 to**
**Educational Base and Criteria for Accreditation**

## Application Forms for Degree Accreditation

- Initial Assessment Form to seek accreditation Form IAF – The notification form must be completed and returned to the given address on page 14 of this document prior to completion of the submission documentation (Form OS Issue 2 and form CEng-IEng/MA2/2004)
- Form OS Issue 2 - Degree Accreditation Submission Document.
- Output Standards Matrix – Form CEng-IEng/MA2/2004
- FP2000 Foundation Programme Submission Document – Approval of a Foundation Programme will only be considered as part of the accreditation of a degree programme
- Accreditation of Masters Degrees (for CEng) and Postgraduate Diplomas (for IEng) form AMP

The above documents are available electronically by contacting
degreeaccreditation@imeche.org.uk