JOINT BOARD OF MODERATORS

GUIDELINES FOR ACCREDITED BACHELORS DEGREE PROGRAMMES LEADING TO INCORPORATED ENGINEER

A degree of a University will meet the academic standing for accreditation at IEng if it contains not less than 300 credit accumulation transfer points, of which not less than 60 are at Level 3 including an individual project. It must also meet the Objectives, Characteristics, and Requirements set out below. This type of degree is hereafter referred to as an IEng degree.

1. Programme Objectives

1.1 Incorporated Engineer (IEng) programmes will have an emphasis on developing and supporting the aptitude necessary to apply technology to engineering problems and processes, and to maintain and manage current technology at peak efficiency. An IEng degree will have an emphasis on industrial application.

1.2 IEng programmes may be specific to one engineering discipline, broadly based over a range of disciplines, or include major subsidiary subjects such as business, management, languages, environmental sciences, always provided that mainstream engineering science and technology dominates, whether of a single or multi-disciplinary nature.

1.3 The structure of the IEng programme will place emphasis on teaching skills and knowledge which make use of the application of engineering principles and standards and codes of practice, rather than exploring in depth the theory behind the standards and codes. The teaching of mathematics should be aimed at developing an ability to use analytical techniques in practical solutions.

2. Programme Characteristics

2.1 An accredited Incorporated Engineer degree is defined by the EC^{UK} as a first cycle degree of three academic years duration full-time programme (or equivalent sandwich or part time) at a minimum QAA Level 6 (Intermediate)/SCQF Level 9. The aim of the IEng degree is to develop the skills, knowledge and attributes which Incorporated Engineers will be expected to display. The programmes will reflect national rather than local needs, but with subjects appropriate to the specific field of engineering, and will be taught with an applications bias. Consequently a degree programme, which meets the IEng requirement, should cultivate:

- Technical proficiency of a high level in a major field of engineering, including the ability to tackle a wide variety of practical problems, however specialised.
- A professional attitude towards matters such as the design reliability and maintenance, sustainability, product quality and value, marketing and safety.
- Oral and written communication skills.

- A professional approach to relationships with clients, customers and colleagues, including supervision of staff, and the ability to work as a member of an engineering team within an ethical framework.
- An appropriate exposure to environmental, health and safety considerations for staff and the general public.

2.2 The IEng degree is distinguished from the HND and a Foundation Degree principally by:

- The extended nature of the project work in the degree.
- The increased level of specialist study in the degree.
- A broader and more general educational base in the degree course, to provide an educational foundation for leadership, social and business awareness and for an appreciation of risk, environmental, health and safety and social issues.

2.3 Standards of academic achievement for entry into IEng degree programmes will continue to form an important criterion for accreditation (see Annex A – Achievement Levels for Entry onto Degree Programmes). However, the Guidelines reflect the need for accreditation to be focused more upon the standards of achievement that are attained during the programmes and the standards reached upon completion of the programme (see Guidelines for Checking Output Standards of Degree Programmes).

2.4 Core and supportive subjects appropriate to the role of an Incorporated Engineer should be identified. It is likely that some programmes will concentrate on specific subjects that they will treat in some depth, and this should be encouraged, provided it is not at the expense of core subjects.

2.5 Universities can submit details of degree courses from associated disciplines such as specialist technology courses but the core areas in paragraph 3.2 would need to be covered in order that the programme can be accredited.

3. Academic Requirements

3.1 Within an IEng degree programme, about sixty percent of the course could be taken up by subjects involving calculation, experiment, observation and deduction. Of the remainder, there should be sufficient mathematics to form a suitable basis for the engineering subjects, as well as other subjects relevant to engineering which broaden the student's appreciation of the work in the construction and transport or built environment industry and the interaction of the engineer with society and with environmental issues.

3.2 There must be an acceptable engineering content in the curriculum that is expected to include appropriate engineering core subjects. The IEng degree programme will normally encompass the following core and compulsory units based on an Edexcel BTEC Higher National Diploma in Civil Engineering. Similar core and compulsory modules will also form part of a Foundation Degree in Civil Engineering. These units incorporate:
Design Principles and Application,
Science and Materials,
Analytical Methods,
Management Principles and Applications,
Group Project
Health, Safety and Welfare,

Geology and Soil Mechanics,
Civil Engineering Construction,
Site Surveying Procedures and
Structural Analysis and Design.

In addition, the degree programme should also cover a selection of six specialist HND units from one of the disciplines of Civil Engineering, Structural Engineering and Transportation Infrastructure. The degree programme should build on these subjects to meet employment needs and progression to further academic studies.

3.3 In addition to the HND and Foundation Degree core, students will also be required to complete an individual project and undertake studies in some of the areas of fluids and hydraulics engineering, mathematics, transport infrastructure engineering, public health, environmental engineering, project management, architectural technology and the further development of civil engineering construction and structural analysis and design.

3.4 The engineering subjects must be taught in the context of design (see Annex B – Design in Degree Programmes), with appropriate account of issues of sustainability (see Annex C – Sustainable Development in Degree Programmes), health and safety (see Annex D – Health and safety risk management in Degree Programmes), and construction. Each issue should form a continuous and integrating thread running through the programme, exposing students to a thorough mixture of engineering principles, the concept of stability, modes of failure, analysis and design. An ability to demonstrate engineering concepts and ideas using sketches and diagrams will enhance the level of understanding and will complement the communication skills referred to in 3.12.

3.5 In order for a course to be accredited the JBM would wish to see a coherent, balanced and integrated programme of learning and development to meet current and foreseeable future needs of the professions.

3.6 The inclusion of units of study at any level, which are outside these guidelines, may be introduced, but their inclusion must be justified.

3.7 All students should be competent in the use of computers and familiar with current examples of software available in the construction industry. Emphasis should be placed upon the solution of practical problems by the use of appropriate modern methods and technology.

3.8 Graduates must have an understanding of environmental issues and the ability to take them into account in design and construction processes. The concepts of sustainability, acceptability and assessment should be introduced (see Annex C – Sustainable Development in Degree Programmes).

3.9 An understanding of health and safety issues and the need to design and operate safe systems of work is mandatory for practising engineers; programmes must expose students to the wider social, commercial and legal contexts and engender an appreciation of the value of design and of good practice in the reduction of risk (see Annex D – Health and Safety Risk Management in Degree Programmes).

3.10 Programmes should introduce the concept of quality systems and the need for a quality approach to be intrinsic to all activities.

3.11 The JBM believes that project work is an important means of introducing a professional approach to engineering studies. For this reason, the use of projects as a vehicle for the integration of subject areas is strongly recommended throughout the course. Normally the final year of the course should include an intellectually challenging project, which could be an individual project, or an integrated group project, which would be individually assessed. The project should pull together the various strands of the course, particularly addressing design synthesis, application and creativity of an engineering application. The assessment of the project should be against criteria for both the process leading to the final project product and also the outcome itself. The project should then be a significant factor in the final award.

3.12 Communication skills and working with others are imperative for engineers. These may be delivered and assessed using the national key skills, which form part of the National Vocational Qualifications (NVQs) framework. Achievement at level 4 would be appropriate for students on first degree programmes. It is fundamental that engineers are able to communicate with confidence and clarity to their professional colleagues, the public and the other professions. Programmes should develop effective verbal and written communication skills, including public speaking and the preparation and presentation of written material in clear precise and grammatically correct English. Students should be encouraged to create and use sketches and diagrams as a direct means of communication or to complement written material or verbal presentation.

3.13 In the final year of the course, emphasis should be placed upon:

- An integrated design project for the built environment using relevant IT.
- The development of skills and the application of knowledge.
- Professional studies including economics, finance and management, legislation, health and safety, sustainability.
- Group and individual work in engineering subjects.
- The development of exploratory learning by students themselves from departmental resource materials, the education institution and industry.

3.14 There should be strong, viable and visible links between departments and the profession. It is desirable that local practising engineers should become involved with the education of students by, for example, giving appropriate lectures, internal talks, assisting with design projects, acting as industrial tutors, and enabling students to make site visits. Regular site visits should be seen as an important element within the programme. It is strongly recommended that an industrial liaison group is established and should meet regularly to advise on change and identify how local and national needs for graduate employment might influence programmes.

4. Sandwich Courses, Vacation Work Experience *and Work-Based Education*

4.1 Students on IEng degree courses will normally be expected to gain some practical work experience or training during their degree programme. This experience or training may be obtained during the industrial periods of a sandwich course or during the long vacations, preferably in periods of at least eight weeks duration. In either case, it is preferable for students to be introduced to engineering applications both on site and in the design office where they can form an integral part of the degree programme. Where they form part of the degree programme, all periods of industrial experience should be monitored by universities

with the undergraduates required to produce reports on their experiences.

4.2 Students receiving sandwich course/vacation/industrial experience should expect to participate in any training/development opportunities that are available.

4.3 Site visits and attendance at professional body/institution meetings are important elements of engineering education and the JBM actively encourages these activities. Direct links between universities and professional bodies are encouraged.

4.4 Good Practice for industrial placements is outlined in Annex E – Industrial Placements in Degree Programmes.

4.4 It is possible for the JBM to accredit work-based education that is designed as part of an accredited degree programme. Work-based education in a degree programme can include work placements, a sandwich course, and vacation placements and work placements as part of a module. A degree programme is made up of periods of learning which are assigned credits. An undergraduate year (usually thirty weeks of formal education) is equivalent to 120 credits. The credits for *work-based education* are different because the student is developing professionally while acquiring knowledge in the work place.

4.5 A *work based education* module is a more intense learning experience than a placement. In both cases there has to be an individual *Learning Plan* for each student.

4.6 The assessment is based on a **portfolio of evidence** including an explanation to place the evidence in context, and how the key learning outcomes were achieved, a number of **assignments that test the knowledge and understanding and the ability to apply that knowledge**, and an **oral presentation**.

5. Extra Mural Activities

It should also be remembered that many qualities upon which employers place considerable importance are developed by involvement with activities external to the department, so these should be encouraged.

6. Programme Amendments

Planned substantial modifications to an accredited programme should be notified to the JBM.