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GUIDANCE FOR COMPLETING THE COMPANY WORK-BASED LEARNING SCHEME SUBMISSION – Chartered Engineer (CEng)

These guidance notes are intended to be read alongside and to complement the Institution of Mechanical Engineers (IMechE) Submission for the Assessment of a Company Work-Based Learning Scheme, to satisfy the Further Learning requirements for Chartered Engineer (CEng) registration by providing information that should be considered before completing the application.

1. BACKGROUND:

The term 'Further Learning' was introduced with the publication of the EC^{UK} document 'United Kingdom Standard for Professional Engineering Competence (UK SPEC)' in May 2004 to describe " ... the way by which individuals whose initial academic qualifications do not meet, in full, the exemplifying requirements for Chartered Engineer (CEng) or Incorporated Engineer (IEng) may demonstrate the required knowledge and understanding." There are many competent engineers who do not hold these exemplifying qualifications, as stated in UK SPEC. However, these engineers can gain registration as a Chartered Engineer (CEng) or Incorporated Engineer (IEng) by demonstrating that they have 'further learning' gained by some other means.

UK SPEC defines the educational base for registration as a Chartered Engineer (CEng) as:

- an accredited BEng (Hons) in engineering plus either an appropriate Masters degree that has been approved or accredited by the IMechE, or appropriate further learning to Masters level. Or, an accredited integrated MEng.

And for registration as an Incorporated Engineer (IEng) the educational base is:

- an accredited Bachelors degree in engineering or technology or a Higher National Diploma or Foundation degree in engineering or technology, plus appropriate further learning to degree level.

There are two reference points for Candidates wishing to attain the requisite level and breadth of the Further Learning requirement for CEng registration:

- The Masters (M) level QAA qualification descriptor - which is critical in determining whether the knowledge, understanding and skills are at the appropriate Masters level.
- The CEng competence statements that the IMechE has adopted under UK SPEC.

The Quality Assurance Agency's (QAA) descriptions of Masters (M) level, Honours (H) level and Intermediate (I) level are printed at the end of this guidance document. Full descriptions can be found at www.qaa.ac.uk/crntwork/nqf/ewni/letter.htm (for England, Wales and Northern Ireland), and at www.qaa.ac.uk/crntwork/nqf/scotfw2001/contents.htm (for Scotland).

2. INTRODUCTION:

In broad terms, Further Learning is about education, and developing knowledge and understanding. It "... is a process which takes an individual from one level to a higher level, and delivers assessed outcomes at the higher level". Further Learning should provide the further evidence of knowledge and understanding, beyond that provided by the initial qualification. It should bring an individual up to the exemplifying level in order to meet the academic requirements, in full, for registration. "The emphasis must be on new learning that is beyond the level of an individual's initial qualification."

Further Learning should not be confused with Initial Professional Development (IPD), although the two may often be linked. IPD is about acquiring competence and demonstrating the ability to apply skills acquired in the workplace. Further Learning may comprise formally taught elements, individual private study, work-based activity or any combination of these, and may, or may not, lead to a formal academic award. Further Learning will often be carried out by engineers employed in an engineering role but this is not obligatory.

Further Learning is, effectively, an equivalent replacement for a formal academic qualification e.g. a Masters qualification for an engineer whose highest academic qualification is a BEng (Honours) degree in an engineering or technology subject. It will, therefore, need to be carried out with the same rigour as a formal, academic qualification. Candidates will need to plan what further learning they need, which will have to be approved by the IMechE prior to commencement. Progress will have to be monitored and assessed and the final outcome will need to be assessed under similar conditions to that of an academic award.

Further Learning for CEng registration must lead to outcomes that are tested at Masters level. Typically, this will mean that candidates for CEng registration will need to demonstrate that they can deal with complex issues both systematically and creatively, and to make sound judgements in the absence of complete data. This will involve originality in tackling and solving problems and implementing tasks at a professional level and, thus, extending their understanding of engineering principles and concepts beyond what was required in the final year of an accredited BEng (Honours) degree.

Further Learning should provide opportunities for candidates to develop; a more in-depth understanding in their chosen area of specialisation; imagination, creativity and innovation skills; a broader education in engineering; an enhanced treatment of business and management and a greater confidence to manage and lead on engineering projects. Where possible a graduate's employer should be involved in the design and delivery of Further Learning. The IMechE recognises that most graduates following the Further Learning route will be employed and, thus, may take several years to produce a satisfactory result.

There are two types of work-based Further Learning available either individually managed programmes or employer-based (company) further learning schemes. Employer-based further learning schemes can encompass unique partnerships between an employer and one, or several, HEIs or course providers, Integrated Graduate Development Schemes (IGDS) or Knowledge Transfer Partnerships (KTP) – formerly known as Teaching Company schemes. Such employer-based schemes will often be approved by the IMechE which removes much of the burden on the graduate, who will know that successful completion of the scheme will satisfy his/her Further Learning requirement fully.

3. SECTION A OF THE SUBMISSION DOCUMENT: GENERIC INFORMATION

The IMechE document entitled 'Submission for the Assessment of a Company Work-Based Learning Scheme to satisfy the Further Learning requirements for Chartered Engineer (CEng) registration' is the submission form which details how a company's proposed Further Learning Scheme enables its graduate employees to meet the requirements of the educational base for registration as a Chartered Engineer (CEng).

Companies are requested to complete all of the sections of A.1 with the current, company information. The expected duration of the scheme does not include any additional time spent learning to bring individuals to a BEng (Honours) level, which may, nevertheless, be part of the company scheme. The Scheme Coordinator is the nominated person responsible for the management of the scheme and will act as the intermediary between the company and the IMechE.

4. SECTION B OF THE SUBMISSION DOCUMENT: SCHEME CONTENT INFORMATION

In developing a scheme which will deliver both Engineering and Science deepening and Broadening of Knowledge a company scheme should incorporate a combination of high level general and specialist engineering knowledge and understanding; application of appropriate theoretical and practical methods to analyse and solve engineering problems; and, knowledge in technical and commercial leadership. This demonstration may be by knowledge gained in the work place or via academic study or a combination of both. However, if the scheme is intended for recent graduates the inclusion of academic modules may be advisable, especially in meeting the Engineering and Science deepening requirement.

If selecting academic modules, it is important to consider the content to ensure they are of a suitable engineering or science base and that the module descriptor clearly demonstrates the level of knowledge (minimum Masters level for Engineering and Science deepening whilst minimum of Bachelors level for Broadening of Knowledge). Key Masters level descriptive words to look out for within the module descriptors are:

- an advanced understanding of...;
- an in depth coverage of... ;
- be able to analyse critically ...;

The associated reading list should also show books and published papers/theories with current editions and recent publishing dates.

An example of an academic module to meet the Masters level Engineering and Science deepening requirement might take the following form:

Summary:

To complete a distance learning 20 credit masters module from the MSc in 'Advanced Materials' from the University of XYZ. The module will be taught over 4 weeks and requires 150 student effort hours. The module will focus on areas such as: thermal, optical and magnetic material properties; evaluation of structure and properties of polymers; Composites such as matrices, strength and stress transfer, anisotropy, laminates, structural foams and processing advances and comparative analysis of unconventional manufacturing processes and developments.

The Associated Learning Outcomes, are as follows:

- Learn how to derive performance indices for selecting materials and manufacturing processes
- Understand how to critically evaluate the relationship between material attributes and modes of structural failure
- Have an understanding of properties of materials in terms of their constituents and structure at both macro and microscopic level
- Learn how to modify component design to ease orientation and assembly

Assessor Details:

Name: University of XYZ, 1 week coursework and final 2 hour exam

Job Position: University set examination papers

Expertise in area: University set examination

If utilising university MSc modules it is important to attach full module descriptors ensuring the academic learning outcomes are clearly detailed.

If selecting an area of work-based learning, again, it is important that the subject matter selected is at the appropriate level. Typically, Broadening of Knowledge (Technical and non-Technical) is more easily delivered in the workplace than Engineering and Science deepening. Again, it is important that the associated **academic** learning outcomes delivered within the work-based learning are clearly detailed.

In terms of the associated learning outcomes of such work, on successful completion of the work graduates should be able to provide evidence of the following:

- Engineering principles and ability to apply them to analyse key engineering processes
- Knowledge to apply quantitative methods and computer software relevant to their work in order to solve engineering problems
- Wide knowledge of design processes and methodologies and how to apply them and adapt to unfamiliar situations
- Knowledge to enable them to generate innovative designs for products, components to fulfil new needs
- Understand how to define and identify design constraints including environmental and sustainable limitations
- Extensive knowledge of management techniques and business practices to achieve engineering objectives
- Understand legal and ethical framework governing engineering activities at work

In the case of meeting the Engineering and Science deepening requirement, however, the graduate will also be required to submit the associated report(s) clearly demonstrating the knowledge and understanding gained to Masters level.

Assessor Details:

Name: Mr A Jones CEng FIMechE

Job Position: Senior Engineer of Company xyz, for the last 7 years.

Expertise in area: Published papers on subject/has been working as senior engineer in xyz topics, leading projects in area for 8 years etc.

Companies may prefer manageable standardised schemes that incorporate flexibility rather than a rigid path of development. This allows for standard pathways, with varied individual starting points and career development aims. Such schemes may be approved so that the assessment processes, the structure and management of the scheme are agreed as a standard pattern. On completion of further learning, individuals in such schemes are assessed only on the basis of whether what they have done within the scheme has enabled them to meet both Engineering and Science deepening and Broadening of Knowledge requirements.

5. MANAGING THE SCHEME: The role of the Company

Companies are expected to provide appropriate support to those graduates requiring Further Learning in the form of induction, documentation, assessment, mentoring and verification. Companies are also expected to provide details of the graduates on the approved Further Learning scheme. Some companies may want to be more involved and could set up a partnership with another organisation, a course provider or a Higher Education Institution (HEI). As an alternative, or in partnership with another employer, a course provider or a HEI, a company may choose to operate a scheme delivered entirely within the workplace. Thus, company-based schemes may combine periods of formal study with work-based learning activities.

The periods of formal study may be provided by an educational institution using courses, or modules, taken from existing programmes, e.g. MScs. Such formal courses may be delivered entirely via distance learning or may require attendance. The IMechE supports the creation of all such schemes to provide effective Further Learning activities and looks to approve these whenever possible. The IMechE will also visit companies running approved schemes to give

seminars on Further Learning, run workshops and offer one-to-one advice to individual graduates.

It is recognised that much, if not all, of the Broadening of Knowledge (technical and non-technical) requirement could be satisfied via work-based learning. Companies intending to use work-based learning as part of an approved scheme are responsible for providing a suitably qualified engineer (the assessor) to verify the Further Learning carried out by the graduate in the work place. Assessors will assess the knowledge and understanding gained by the graduates against the identified learning outcomes and then sign off the relevant section on the IMechE record assessment sheet. These assessment sheets should be kept as part of the supporting evidence and should highlight what has been learnt during a particular phase and show how the learning has been applied in the workplace, if appropriate. Assessors must work within an agreed Quality Assurance system.

In the case of a partnership between the company and a university, college and/or course provider schemes may consist of some work-based learning and a number of formally taught modules that have been tailored to the specific needs of the company. The advantage of part or all of the Further Learning being delivered by a university, college or course provider is that it will be subject to rigorous and valid independent assessment, a key requirement of all Further Learning. Additionally, the graduate may acquire an academic qualification, in addition to their Further Learning, although this is not a requirement of Further Learning.

The graduate should obtain verification, that the experiences described are valid and are his/her own work, from a senior engineer/manager within the Company. This verification could include an appraisal of a report together with a probing discussion of what had been learnt.

6. MANAGING THE SCHEME: The role of the Graduate

The graduate will be a member of the IMechE, usually either an Affiliate or Associate Member, who wishes to register through the IMechE as a Chartered (CEng) but does not hold the requisite exemplifying qualifications for registration. He/she will follow a route of academic learning, or equivalent learning, to meet agreed prescribed learning outcomes. The graduate is responsible for achieving the agreed Learning Outcomes, for completing the necessary Further Learning reports and for providing the necessary evidence, including IMechE assessment sheets, prior to approval by the IMechE.

A graduate will be required to build a portfolio of evidence during the period of Further Learning. A typical portfolio would include technical reports, assessment sheets with assessor's comments, engineering drawings, statistical data, photographs, graphs and mathematical formulae. The portfolio should also contain evidence that the learning carried out by the graduate is valid and his/her own work. In the case of some, or all, of the Further Learning being carried out as part of an academic qualification evidence of successful completion of the course/module(s) will be required.

Graduates will need to provide transcripts of the marks awarded where an activity has been formally examined by a third party. If the graduate attended a course(s) then evidence of the learning outcomes from the course should be provided; course attendance certificates alone will not satisfy the Further Learning requirements.

Once a graduate has completed his/her Further Learning he/she should submit the authenticated evidence of each of the learning outcomes completed through the approved Company Further Learning Scheme. This evidence can be one of the following depending on the combination of further learning within the Company scheme:

- University Degree Certificate
- University Transcripts indicating completed modules
- Training Course Certificate displaying assessment (not attendance)
- Work Based Learning assessment reports.

There is no requirement to submit the actual course work or project reports completed during the period of Further Learning; only the above evidence of assessment is required. Photocopies of evidence documents must be authenticated with the statement "this is a true and fair copy of the original" by either of the following:

- the University
- a Chartered Engineer or Incorporated Engineer (or equivalent level of professional registration overseas)
- Senior-in-charge or, a member of the company's HR department.

A professional person such as a Chartered Engineer, a Personnel Manager or Chief Executive, should authenticate and sign off the final completed record.

7. MANAGING THE SCHEME: The role of the Assessor

Further Learning activities can be assessed via a number of methods, which would include formal examinations, certification, by viva, reports, presentations or through in-depth discussions with a senior engineer (the assessor). All work based learning must have written evidence of assessment against a set of defined assessment criteria. The 'criteria' are usually dictated by the Learning Outcomes identified in the plan. Hence these must be detailed and explicit on what learning should be undertaken. The associated Learning outcomes will form the basis of a viva voce assessment for work where there is no formal examination process; the IMechE work based learning assessment form should be used to record this. All assessment must be rigorous and robust

Assessors may come from a range of technical backgrounds and, ideally, will have experience of both academic standards and the engineering profession and will typically be a Chartered Engineer. They will be conversant with UK SPEC learning outcomes and know how to assess knowledge and understanding. They are required to make valid and reliable judgements on the graduate's evidence to confirm whether the graduate has gained the necessary breadth, depth and integration of knowledge that would have been acquired had he/she held the exemplifying qualification. Assessors will need to be able to assess different types of evidence in various formats. The Assessor will then provide appropriate feedback to the graduate using the IMechE assessment form.

These assessment sheets should be kept in conjunction with any reports or projects that were identified as fulfilling areas of the plan. All of this evidence should highlight what has been learnt during a particular phase and demonstrate how the learning has been applied in the workplace. A Senior Engineer, within the employer's company, should also verify that the Candidate's experiences are valid and, indeed, his/her own work.

8. MANAGING THE SCHEME: The role of the IMechE

The Institution of Mechanical Engineers (IMechE) is a Licensed Body of the Engineering Council and, as such, will interpret UK SPEC accurately to ensure that individuals and organisations will be given correct advice on Further Learning, necessary for full membership and registration. The IMechE will also use all of the options made available to Licensed Bodies and exemplified in UK SPEC as well as exploring novel approaches to meeting the Further Learning needs of its customers. Schemes submitted by companies will be assessed by the IMechE Academic Assessment Committee, comprising experienced and knowledgeable engineers from industry and academia.

The IMechE is licensed to approve individual applicant's Further Learning plans and submitted programmes with supporting evidence. The Institution can also approve employer-based Further Learning schemes. The IMechE will offer specific advice regarding the further learning requirements of individuals and visit companies to host workshops and one-to-one meetings with employees requiring Further Learning. It will draw from its wider membership, individual registered engineers to act as advisers to graduates, assessors for the assessment of submitted Further Learning programmes and supporting evidence and representatives to visit companies and/or HEIs to host workshops and to carry out accreditation/approval visits. The IMechE will offer support to graduates whilst undertaking Further Learning although such contact should, ideally, be kept to a minimum. Graduates should seek support from their personal tutors (if at an HEI) and/or their employers before contacting the IMechE.

The IMechE will also confirm whether a degree has been accredited through the on-line Qualification Checker service. If a graduate's qualification is not accredited, or he/she has no formal qualifications the Academic Assessment Committee (AAC) can review a graduate's academic achievements for either CEng or IEng registration. The AAC can either accept submitted qualifications as they are or recommend further steps to enable the employee to meet the criteria.

This assessment must be completed before completing a Further Learning application, as the outcome will determine whether further learning is necessary.

9. QUALITY ASSURANCE AGENCY (QAA) Descriptors:

The Quality Assurance Agency's (QAA) definition of the qualifications at Intermediate (I) level, a non-Honours degree; at Honours (H) level, Bachelors degree with Honours and at the Masters (M) level, a Masters degree. The definitions give an insight into the level of understanding that Incorporated Engineers and Chartered Engineers are expected to achieve.

Intermediate Level (for IEng) - Non-Honours degrees

Non-Honours degrees are awarded to individuals who have demonstrated:

1. knowledge and critical understanding of the well-established principles of their area(s) of study, and of the way in which those principles have developed;
2. ability to apply underlying concepts and principles outside the context in which they were first studied, including, where appropriate, the application of those principles in an employment context;
3. knowledge of the main methods of enquiry in their subject(s), and ability to evaluate critically the appropriateness of different approaches to solving problems in the field of study;
4. An understanding of the limits of their knowledge, and how this influences analyses and interpretations based on that knowledge.

Applicants will be able to:

1. use a range of established techniques to initiate and undertake critical analysis of information, and to propose solutions to problems arising from that analysis;
2. effectively communicate information, arguments, and analysis, in a variety of forms, to specialist and non-specialist audiences, and deploy key techniques of the discipline effectively;
3. undertake further training, develop existing skills, and acquire new competences that will enable them to assume significant responsibility within organisations;

and will have the qualities and transferable skills necessary for employment requiring the exercise of personal responsibility and decision-making.

Honours (Hons) level - Bachelors degree with Honours (may be appropriate for IEng or as a contribution to CEng depending on the nature of the programme)

Honours degrees are awarded to individuals who have demonstrated:

1. a systematic understanding of key aspects of their field of study, including acquisition of coherent and detailed knowledge, at least some of which is at or informed by, the forefront of defined aspects of a discipline;
2. an ability to deploy accurately established techniques of analysis and enquiry within a discipline;
3. conceptual understanding that enable him or her to:
 - devise and sustain arguments, and/or to solve problems, using ideas and techniques, some of which are at the forefront of a discipline; and
 - describe and comment upon particular aspects of current research, or equivalent advanced scholarship, in the discipline;
4. an appreciation of the uncertainty, ambiguity and limits of knowledge;
5. the ability to manage their own learning and to make use of scholarly reviews and primary sources (e.g. refereed research articles and/or original materials appropriate to the discipline).

Applicants will be able to:

1. apply the methods and techniques that they have learned to review, consolidate, extend and apply their knowledge and understanding, and to initiate and carry out projects;
2. critically evaluate arguments, assumptions, abstract concepts and data (that may be incomplete), to make judgements, and to frame appropriate questions to achieve a solution – or identify a range of solutions – to a problem;
3. communicate information, ideas, problems and solutions to both specialist and non-specialist audiences;

and will have the qualities and transferable skills necessary for employment requiring:

- the exercise of initiative and personal responsibility;
- decision-making in complex and unpredictable contexts; and
- the learning ability needed to undertake appropriate further training of a professional or equivalent nature.

Masters (M) level – Masters degrees

Masters degrees are awarded to individuals who have demonstrated:

1. a systematic understanding of knowledge, and a critical awareness of current problems and/or new insights much of which is at, or informed by, the forefront of their academic discipline, field of study or area of professional practice;
2. a comprehensive understanding of techniques applicable to their own research or advanced scholarship;
3. originality in application of knowledge, together with a practical understanding of how established techniques of research and enquiry are used to create and interpret knowledge in the discipline;
4. conceptual understanding that enables an individual
 - to evaluate critically current research and advanced scholarship in the discipline; and
 - to evaluate methodologies and develop critiques of them and, where appropriate, to propose new hypotheses.

Applicants will be able to:

1. deal with complex issues both systematically and creatively, make sound judgements in the absence of complete data, and communicate their conclusions clearly to specialist and non-specialist audiences;
2. demonstrate self-direction and originality in tackling and solving problems, and act autonomously in planning and implementing tasks at a professional or equivalent level;
3. continue to advance their knowledge and understanding, and to develop new skills to a high level.

and will have the qualities and transferable skills necessary for employment requiring:

- the exercise of initiative and personal responsibility;
- decision-making in complex and unpredictable situations; and
- the independent learning ability required for continuing professional development.

10. SUPPORTING INFORMATION:

A list of approved Company Schemes can be found at the following link:

<http://www.imeche.org/Libraries/TAPD/ApprovedFLCompanySchemeListJuly2010.sflb.ashx>

An IMechE Committee that comprises experienced and knowledgeable Chartered Engineers representing industry and academia will assess your proposed Further Learning Scheme. It is important that you clearly define the content of your proposed Further Learning and supply any additional supporting information. There is currently no fee for submitting a Company Further Learning Scheme.

X1 complete copy of the form (including relevant supporting information) should be sent to: Further Learning, Accreditation & Professional Development Department, Institution of Mechanical Engineers, Birdcage Walk, London, SW1H 9JJ.

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