

RESTRICTED

Professional Accreditation Handbook (Engineering Degrees)

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1. PROFESSIONAL ACCREDITATION

1.1 Introduction

The Hong Kong Institution of Engineers (the HKIE) is the professional engineering learned society and qualifying body for Hong Kong and as such has a responsibility for setting and maintaining the professional and technical standards of its members. To this end, it evaluates the qualifications for admission to grades of Institution membership.

The academic qualification for Corporate Membership of the HKIE is an accredited engineering degree at the honours level. The HKIE's process of accrediting such programmes is called professional accreditation. (A description of professional accreditation is provided in the Appendix.) This handbook sets out the HKIE's processes, mechanisms and criteria for the professional accreditation of engineering degree programmes.

The Institution would like to emphasise that accreditation is a collaborative activity between the profession and the academic institutions. It does not view the accreditation of engineering degree programmes as discrete and limited exercises, but as part of a process to work with the universities on a continuous basis, to provide help, advice and support, to ensure that the quality of engineering degree programmes is high and meets the needs of professional engineers, their employers and Hong Kong society in general.

The HKIE takes very seriously its responsibilities with regard to the Washington Accord and to fostering, maintaining and developing bilateral and international agreements for the mutual recognition of qualifications. This is undertaken through links with a number of international engineering initiatives which have been established to harmonise qualifications and to recognise accreditation methods and standards; the Washington Accord, Federation of Engineering Institutions of South East Asia and the Pacific (FEISEAP) and European Federation of National Engineering Associations (FEANI) are examples.

1.2 Accreditation by Faculty

Essentially, the HKIE is concerned with the standards and quality of individual engineering degree programmes. Consequently, it is the individual programme which receives accreditation. However, the process of professional accreditation also considers the appropriate Faculty in terms of its overall philosophy, objectives and resources. This has the advantage of taking into account the broad principles and policies of the development of engineering education in a university.

Furthermore, consideration of a range of programmes has particular advantages in relation to modular programmes and ones containing a number of elective courses.

Although visits will normally be by Faculty, there may be visits to individual departments within a Faculty for the purposes of provisional accreditation, to consider

major modifications to a programme or to monitor a programme which had been granted accreditation for less than the normal five years.

1.3 Initiation of Accreditation Exercises

The professional accreditation of engineering degree programmes in the universities is normally initiated by a university issuing an invitation to the HKIE's Accreditation Board to carry out appropriate accreditation exercises.

1.4 Consultation and Accreditation Visits

As mentioned in the introduction, the HKIE sees accreditation exercises as a continuous activity. Accordingly, any university planning new engineering degree programmes, or restructuring existing ones, is encouraged to consult the HKIE in order to ensure that the engineering degree programmes are developed such that the requirements of all concerned are fully addressed.

1.5 Provisional and Full Accreditation

The HKIE undertakes provisional accreditation exercises to consider programmes which have yet to produce the first cohort of graduates, and, full accreditation exercises for the consideration of existing programmes, whether they have been previously accredited or not.

1.6 Accreditation Decisions and the Accreditation Cycle

The HKIE can reach four accreditation decisions as follows:

- a. the programme be granted provisional accreditation with or without conditions;
or
- b. the programme be granted accreditation for a term of up to five years with or without conditions; or
- c. the programme not be granted accreditation; or
- d. the accreditation of the programme be revoked.

1.6.1 Provisional Accreditation

Provisional accreditation may be granted to developing programmes with or without conditions, and generally the relevant accreditation exercises will be completed during the second-half of the programme of the first cohort of intake. Provisional accreditation provides an indication

to both the university and prospective students that the programme is well structured and has very good possibilities of receiving full accreditation but should not be construed as a commitment to the granting of full accreditation.

1.6.2 Accreditation for a Period of up to Five Years

The HKIE may grant full accreditation for the normal cycle of accreditation of five years. Alternatively, the HKIE may grant full accreditation for a term of less than five years, either to bring it in line with the accreditation cycle of other programmes or to monitor a programme early in relation to any conditions, requirements and/or concerns which may have emerged during the accreditation process.

For a newly developed programme, a full accreditation exercise is mounted, at a time agreed with the university, after the first cohort of graduates is produced. Full accreditation, if granted, will be retrospective so as to apply to the first cohort of graduates.

1.6.3 Accreditation Refused or Withdrawn

If a programme is substantially at variance with the HKIE criteria (see section 2), then the accreditation can be refused or withdrawn.

1.6.4 Revocation of Accreditation

If a university fails to meet conditions imposed on a programme by the previous accreditation or if it has introduced changes which make the programme seriously at variance with the HKIE criteria, then the accreditation can be terminated.

1.7 The Accreditation Panel

The HKIE Accreditation Panel (not to be confused with visiting teams) is a group of appropriately qualified senior members, appointed by the HKIE Accreditation Board, to participate in professional accreditation exercises, on behalf of the HKIE.

In addition, professional engineers from overseas, with appropriate expertise are invited by the Accreditation Board to be included on the Panel.

1.8 Visiting Teams

Visiting teams shall be selected from the Panel for each particular accreditation exercise. Team members are selected on the basis of their expertise and that they have no professional or any other association with the university, nor do they have family members attending it. Team members should declare that they have no conflict of

interest when taking up the appointments. The Dean or Head of Department shall be informed of the names of the proposed chairman and members of the team, and objection to team members may be made if they feel there is a conflict of interest.

1.8.1 Team Size and Constitution

For a single discipline exercise, the team shall normally comprise four members including the chairman. All members shall be experienced in the discipline, or associated with it. For exercises involving two or more programmes, which may cover several engineering disciplines, there shall be at least two members from, or associated with, each of the disciplines.

For each accreditation exercise, the Accreditation Board will also appoint one of its members, who can join the accreditation visit as an observer, to act as an assessor. The assessor will study all the documentation and, in consultation with the visiting team chairman, make recommendations to the Board for an accreditation decision.

The accreditation visiting team shall have a proper mix of academics and practising professional engineers. All the team members shall have training/ briefing on professional accreditation, and the majority of them will also have prior experience in professional accreditation. To ensure continuity and expertise, the team chairman shall have considerable previous experience in professional accreditation.

Whenever possible, members of the Accreditation Board shall be invited to participate in the visits. In addition, the HKIE secretariat staff shall accompany the visiting team.

1.9 Accreditation Visits

Accreditation visits are an important part of an accreditation exercise. They enable the HKIE to assess, at first hand, qualitative factors, such as facilities, intellectual environment, morale, professional attitudes and the quality of staff and students.

For programmes which are being planned by a university, the HKIE will arrange consultation visits by experts as appropriate in each case. On such visits, the experts shall only comment and advise on the proposed programmes and shall not commit the HKIE to granting accreditation to a programme.

It should be noted that the accreditation visit is only a part of the full accreditation exercise. There is considerable preparation prior to a visit and work to be done after the visit.

A visit will normally take one and a half days and shall include:

- meetings of the team with the appropriate senior university staff;

- meetings with the programme leader and other academic staff;
- meetings with the students and support staff;
- visit to the departmental facilities, including lecture theatres, laboratories, library and computing facilities;
- review examination papers and examination scripts, laboratory instructions, reports and design assignments, project reports and other material demonstrating student performance;
- private meetings of the team; and
- an exit meeting with the Dean and senior staff to convey the team's initial observations.

1.10 Accreditation Reports

At the end of a visit, the team chairman, with the assistance of the HKIE secretariat, shall draft a formal report based on a consensus of opinion and the observations of the team, and assess whether the programme conforms to the HKIE Accreditation Criteria.

The following procedures have been adopted by the Accreditation Board in dealing with the Accreditation Report.

- (i) The visiting team chairman will draft the report with the assistance of members of the team and the HKIE staff.
- (ii) The draft report will be sent to the visiting team members for comment.
- (iii) The comments made by the members of the visiting team will be considered by the chairman.
- (iv) The draft report will then become the final report.
- (v) The final report will be sent to the Dean and relevant Heads of Departments for comment.
- (vi) The comments made by the Dean and Heads will be sent to the visiting team chairman and the assessor.
- (vii) The final report, and the comments made by the Dean and Heads will be submitted to the Accreditation Board at the decision meeting.

The HKIE maintains strict confidentiality regarding accreditation matters. It is for the university to decide how information related to this accreditation should be released and may inform HKIE accordingly.

1.11 Accreditation Decisions

The Chairman of the Board will initiate the discussion on the programme under consideration.

The accreditation report and university responses, and all other relevant information and correspondence will be passed to the Board for a decision.

The representatives of the university concerned, usually the Dean and/or Head of

Department may attend that part of Board meeting devoted to the presentation of the report. Members of the visiting team may also be present.

At the meeting, the visiting team chairman will present the report and representatives of the university may put forward further information and answer questions of fact. The Board will then conduct a private meeting from which University representatives are excused. The assessor will present recommendations. The Board may then make decisions on the programme.

The Secretary to the Board will write to inform the university of the decision with a copy of the final report, in confidence, to the university Vice Chancellor/President/Director, copied to the relevant Dean and Head of Department.

1.12 Costs

Any university having its engineering programmes on the HKIE list of accredited degrees shall pay a fee to the HKIE in April of each year. The fee will be based on the number of undergraduate engineering degree programmes of the university and shall be agreed by the concerned parties.

The direct costs of each accreditation exercise (travel, subsistence, accommodation) will be paid by the university concerned.

1.13 Confidentiality

All documents and other information obtained by the Accreditation Board during the course of an exercise are kept confidential.

1.14 Appeal Procedures

In the event of a decision by the Accreditation Board to refuse or terminate accreditation of an engineering degree programme, the university concerned has the right to appeal to the President of the Institution to review the decision.

1.15 Publication

A full list of accredited programmes and their period of accreditation is published on the HKIE website.

2. CRITERIA FOR THE ACCREDITATION OF ENGINEERING DEGREE PROGRAMMES

2.1 Introduction

The HKIE undertakes professional accreditation to evaluate the standard and quality of engineering degree programmes. In doing so it takes into account a number of factors about the programmes and the universities which offer them. The quality of an engineering degree programme depends on more than just the curriculum and syllabus. The quality of the graduates is an important consideration in the evaluation of an engineering programme. The degree programme must define outcomes that they expect of their graduates consistent with their educational objectives and the needs of the discipline; and describe the processes that are used to measure and evaluate these outcomes. In addition, the calibre of the academic staff, the entry standards, staffing levels, teaching methods, facilities, funding and method of assessment are just some of the factors which influence the quality of the educational experience and the outcomes.

The following describes broad criteria which are used by the HKIE regarding appropriate engineering degree programmes for the profession. In setting them out, the HKIE considers it important, both in the context of educational and professional objectives, for universities to encourage an environment which can accommodate innovative educational developments and to allow for the expression of the university's individual strengths, qualities and ideals.

2.2 Standards

The HKIE seeks to conform with internationally recognised standards in terms of accreditation processes and outcomes.

2.3 Aims and Objectives

In its submission for accreditation of an engineering degree programme, a university should be able to express the aims, objectives and ethos of the programme both in relation to the appropriate standards of degree level education and the requirements of the profession. The university should demonstrate how its programmes meet the aims and objectives, and how they can respond to future developments.

The HKIE appreciates that engineering degree programmes are dynamic entities which must evolve with technology and the changing needs of the profession and society. Consequently, the HKIE expects a university to be able to articulate such developments in terms of how the structure and rationale of its programmes can respond to change. Based on generally accepted norms, engineering programmes must demonstrate that their graduates have the following attributes:

(a) an ability to apply knowledge of mathematics, science, and engineering

- appropriate to the degree discipline
- (b) an ability to design and conduct experiments, as well as to analyse and interpret data
 - (c) an ability to design a system, component or process to meet desired needs within realistic constraints, such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability
 - (d) an ability to function on multi-disciplinary teams
 - (e) an ability to identify, formulate and solve engineering problems
 - (f) an ability to understand professional and ethical responsibility
 - (g) an ability to communicate effectively
 - (h) an ability to understand the impact of engineering solutions in a global and societal context, especially the importance of health, safety and environmental considerations to both workers and the general public
 - (i) an ability to stay abreast of contemporary issues
 - (j) an ability to recognize the need for, and to engage in life-long learning
 - (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice appropriate to the degree discipline
 - (l) an ability to use the computer/IT tools relevant to the discipline along with an understanding of their processes and limitations

2.4 Duration

The HKIE believes that engineering degree programmes should have a minimum duration of four years full-time equivalent, of which a one-year full-time equivalent consists normally of about 26 weeks of classroom, laboratory, workshop and related activities. (Time allocated to assessment, field work and practical training fall outside these 26 weeks.)

The criteria set out here provide broad guidance for a four year full-time equivalent programme. It is accepted that a longer programme than this will enable an academic institution to introduce subjects and activities which could contribute further to the education of an engineering undergraduate, but the onus is on the university to demonstrate that the programme contains at least the equivalent of the four years which meets the HKIE's requirements. When technology based delivery of content is used the university must demonstrate the equivalence of this method with traditional delivery methods.

2.5 Part-time Engineering Degree Programme

If a part-time engineering degree programme is offered, or if a student undertakes a programme on a part-time basis, all requirements of an accredited programme must be met.

2.6 Syllabus and Curriculum

The HKIE does not wish to impose uniformity on universities in relation to

curricula and syllabuses, but encourages them to develop courses, making the best use of resources, responding to academic and technological change, and recognising the needs of the students, community and profession. Nevertheless, the HKIE does require course content to be sufficient to enable undergraduates to acquire, within the duration of a programme, the basic knowledge, understanding and skills necessary to enable them to practise in an effective and professional manner as a graduate engineer. Course sequences in the curriculum must provide for breadth and depth appropriate to the discipline, and the University must demonstrate that prerequisites are followed.

The HKIE accepts that over the whole range of the engineering disciplines it is not possible to state precisely the essential characteristics and content of courses and programmes. However, the Institution expects the curricula to prepare students in a broad range of engineering subjects, mathematics and complementary support subjects, appropriate to the degree discipline. The Institution considers that these would normally include (a) one year of mathematics and basic sciences, (b) at least two years of engineering topics, including engineering sciences and engineering design and, (c) complementary studies that support the professional nature of the curriculum. A description of each is given below to provide guidance, but is not considered to be all inclusive. The programme must ensure that its curriculum is consistent with the prescribed outcomes and objectives. The presence of each of the above elements in the curriculum is not sufficient evidence that the graduates have the outcomes that the programme desires.

2.6.1 Mathematics and Basic Sciences

The HKIE considers that the mathematics content of degrees should underpin the engineering subjects, and should emphasise mathematical concepts, and principles, numerical analyses and applications and their relationship to the modelling of engineering systems. It is accepted that these can be delivered as separate topics, however, the HKIE believes that it is also desirable for mathematics to be delivered within the context of its application in engineering situations and be within the engineering subjects of the programme.

The HKIE regards basic sciences as the foundation of engineering sciences and are indispensable parts of an engineering programme. Basic sciences include physics, chemistry, biology and other science subjects that are relevant to a particular field of study.

2.6.2 Engineering Subjects

a. Engineering Sciences

Engineering sciences have their roots in mathematics, physics and other basic sciences, but carry knowledge further towards creative application. They may include such subjects as mechanics of solids, fluid mechanics,

thermodynamics, electrical and electronic circuits, computer science, materials science, soil mechanics, aerodynamics, control systems, transport, and so on depending on the discipline.

In an engineering degree programme, the HKIE expects a university to provide engineering courses for the appropriate discipline, and others which provide an appreciation of related disciplines, to support the educational objectives and outcomes desired.

b. Engineering Design and Synthesis

The HKIE believes the importance of design and synthesis is such that a separate appropriate topic should be established. However, it is accepted that because of the applied nature of this activity to almost every engineering endeavour it could be delivered within the engineering science courses in a programme. Its establishment as a separate topic can be used to demonstrate that it is a creative, iterative and often open-ended process and to also enable discussion of general design techniques and philosophy, as well as financial, quality, safety and environmental implications.

c. Health, Safety and the Environment

The programme should demonstrate the importance of health, safety and environmental considerations to both workers and the general public.

d. Laboratory and Field Work

Courses should be supported by meaningful laboratory work, well co-ordinated with the lecture material and supported with relevant up-to-date equipment. If a university utilises laboratories at different locations or uses different delivery formats, they must provide evidence to show that every student receives a laboratory experience that is meaningful, well co-ordinated, and up-to-date.

Residential field courses in subjects such as surveying and geology are considered important where these subjects are an integral part of the programme.

e. Project

The HKIE believes that project work is an important means of introducing engineering approach to solution of problems. For this reason, the extensive use of projects is expected in every engineering degree programme. Normally, the final year of the programme should include an intellectually challenging project which is individually assessed. The project should involve design, synthesis, application and/or creativity. The assessment of the project should have a significant

weighting in the degree classification.

2.6.3 Complementary Studies

Studies which provide an appreciation of those wider issues which enable engineers to practise professionally in society should be fully integrated within the programme. Such studies may include management, economics, law, history, finance or a foreign language. Furthermore, the following elements should be included in the curriculum.

a. Practical Training

The HKIE recognises the benefits of practical experience obtained during an engineering degree programme and recommends that students aggregate significant, relevant practical training or employment. This will normally be obtained during vacations or in a "sandwich" year, and universities should encourage this activity.

b. Communications

The HKIE cannot over emphasise the need for professional engineers to have good communication skills. Engineering degree programmes should contain instruction in both oral and written communication skills as well as presentation skills.

c. The Professional Engineer

It is considered that students should be introduced to the role of the professional engineer in practice and their responsibilities towards the profession, colleagues, employers, clients and the public, particularly with reference to the impact of technology on society and with regard to ethical behaviour. Furthermore, they should be made aware of the role of the engineering institutions and matters of professional practice such as licensing and registration.

They should also be encouraged to become student members of the HKIE and to take part in its activities.

2.7 Academic Staff

An important factor in determining the standard of an engineering degree programme is the quality and commitment of the teaching staff. The programme must demonstrate that they have academic staff consistent with delivering the educational objectives and outcomes desired. The qualifications and number of staff is a necessary, but not sufficient criteria in establishing the appropriateness of the teaching cadre.

2.8 Resources

Engineering degree programmes rely on the satisfactory provision of technical and administrative staff, administration, laboratories, information services, computing facilities, finance and other resources as follows:

2.8.1 Support Staff

There should be sufficient number of technical and workshop staff with adequate qualifications and experience to ensure the smooth and safe management of laboratories, maintenance of equipment and to provide general support.

There should also be sufficient number of administrative and secretariat staff to support the academic staff.

2.8.2 Accommodation and Equipment

There must be adequate provision of lecture rooms, laboratories, workshops, drawing offices and private study areas to support the programme of lectures, tutorials and practical classes. Laboratories should be well equipped with adequate and modern equipment and should provide a safe working environment for the students.

2.8.3 Computing Facilities

Computing facilities should be consistent with the aim of using computers as part of the engineering education experience. These facilities must be appropriate for laboratory work and engineering applications such as modelling and simulation and computer aided design.

Students should have easy and adequate access to such facilities.

2.8.4 Information Services

The university should provide adequate resources for information services which include conventional and up-to-date methods and facilities for example, books, journals, tapes, films, disks and databases, and the Internet.

Conventional library facilities should provide a range and variety of technical and non-technical books, and a comprehensive range of journals covering all engineering disciplines. The inter-library loan system should be available to all students, together with abstract and literature search facilities for project work. Students should have easy and adequate access to these facilities.

2.8.5 Financial Resources

There should be adequate financial resources to ensure the smooth operation of the department, the provision and maintenance of laboratories, computers, libraries and other support facilities as well as for the development of the staff, programmes, courses and the upgrading of equipment.

2.9 Assessment

Assessment of student performance should demonstrate the effectiveness of the learning process in achieving the programme outcomes.

The HKIE believes that there should be an effective internal quality assurance system which is essential to maintain the academic standards of programmes. In addition, there should be an independent quality assurance system such as an external examiner system or equivalent.

2.10 Entry Levels

The HKIE does not prescribe minimum qualifications for entry to engineering degree programmes, but it does expect that the selection criteria are consistent with the majority of students being able to complete the programme at the expected standard.

The programme must demonstrate that the selection procedures in place are consistent with the selection criteria and the expected outcomes.

2.11 Development

The HKIE believes it is incumbent on an academic institution to be sensitive to the requirements of society and the profession, and consequently, to develop programmes to respond to local and international requirements and to provide opportunities for staff to be able to develop their skills so that they can deliver programmes meeting local and international professional and academic standards. In order to do this, the HKIE believes that universities have a responsibility to liaise with the engineering profession and industry in relation to engineering degree programmes and their development.

2.12 Programme Amendments

It is expected that from time to time there will be evolutionary changes to a programme within the period of its accreditation. Any modification to a programme should maintain the spirit of the programme as accredited and may include such

changes as:

- a change in the title of the programme;
- a change in the length of the programme;
- the addition of options and/or streams;
- the deletion of some subjects;
- a significant change in the provision of resources for the programme.

The university should inform the HKIE of the above and other major curriculum or operational changes. The Board may then consider any subsequent actions including initiation of a visit or request of a written report.

3. ACCREDITATION SUBMISSIONS

When preparing a submission for professional accreditation, the university is advised to consider the criteria in section 2 carefully, and to consult the HKIE as appropriate.

3.1 Provisional or Full Accreditation

The information requested in the following sections relates to both provisional and full accreditation submission.

For the provisional accreditation of developing programmes the process should normally commence at least six months before the first cohort of intake has reached the half way stage of the programme, at which time a university should provide the preliminary details (section 3.2).

For the full accreditation of existing programmes, a university should submit the preliminary details no later than six months before the expiry of the current approval.

For the full accreditation of developing programmes the exercises may commence at a date, mutually acceptable to the HKIE and the university, after the first cohort of graduates has emerged. The preliminary details should be submitted no later than six months before the visit.

In both cases, the full information requested (section 3.3) should be submitted at least six weeks before the date of any visit. If as a result of considering the submission further information is required, the chairman of the HKIE's Accreditation Board, in consultation with the chairman of the visiting team and the university may arrange to delay the timing of any visit or, in exceptional circumstances the cancellation of the exercises.

3.2 Preliminary Details

A university seeking accreditation of a programme is required to submit the following preliminary details:

1. title of the Faculty or Department;
2. names, qualifications and date of appointments of Dean and Heads of Department;
3. title of the programme;
4. name of programme leader;
5. accreditation sought (provisional or full);

6. brief resume, 100 words maximum, about the programme submitted;
7. provisional dates for the visit.

Upon receiving the preliminary details, HKIE will contact the university seeking further information and/or providing further directions related to the full submission.

3.3 Full Information

Submission of full information for accreditation should be made by completing the questionnaire contained in the HKIE standard submission format. Softcopies of the questionnaire are available from HKIE upon request. Copies of the completed questionnaire are to be provided at least six weeks before the date of a visit. The questionnaire is set out as follows:

- Part 1: General information related to the university/institution
- Part 2: General information related to the department
- Part 3: Information related to the engineering programme – general
- Part 4: Information related to the engineering programme – criteria specific

3.4 Information to be Available During the Visit

The following materials and representative samples of student work that reveal the spectrum of educational outcome are to be made available during the accreditation visit:

1. Evidence of process used to identify educational objectives.
2. Evidence of process used to identify programme outcomes.
3. Evidence regarding students' achievement of the intended learning outcomes at various stages of the programme. This may include student's work, e.g. examination papers; marked examination scripts; examples of final year projects, laboratory reports; external evaluation etc.
4. Evidence of process used to improve the educational system of the programme including changes that have been made and/or proposed.

APPENDIX

NOMENCLATURE

Academic Accreditation

Evaluation or assessment to determine whether the academic standards of an institution of higher education are comparable with internationally recognised standards. It includes course validation, course revalidation, institutional review and institutional accreditation.

Professional Accreditation

The evaluation and comparison of the academic standards of a degree or sub-degree programme and consideration of the appropriateness of the education component of that degree or sub-degree programme for professional practice.

The Accreditation Panel

Those Members of the Institution who are appointed to carry out professional accreditation visits on behalf of the HKIE.

The Accreditation Exercise

The full professional accreditation process.

The Accreditation Visit

A visit to an academic institution as an integral part of the professional accreditation exercise.

The Visiting Team

Members of the Accreditation Panel selected to carry out a specific accreditation exercise.

Programme

Refers to the complete curriculum of a degree, comprising courses/modules/credit units, assignments, workshops, projects and so on.

Course

Refers to a specific taught part of a degree programme (course is sometimes used to describe a whole degree programme, where that programme has a fixed curriculum). Courses are sometimes referred to as subjects, modules or credit units.

