This document is optional to be used by higher education institutions for programmes seeking accreditation between September 2026 and August 2028 and mandated to be used from September 2028 onwards

RESTRICTED

Professional Accreditation Handbook (Engineering Degrees)

Revised by authority of the Accreditation Board as of October 2024

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2. CRITERIA FOR THE ACCREDITATION OF ENGINEERING DEGREE PROGRAMMES

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1. HKIE ACCREDITATION FOR ENGINEERING DEGREE PROGRAMMES

The Hong Kong Institution of Engineers (the HKIE) is the professional engineering learned society and qualifying body in Hong Kong. It sets and maintains the professional and technical standards of its members. The HKIE conducts accreditation to ensure that the programmes accredited meet the required standards to satisfy the education formation for members.

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 Appendix I.) This handbook sets out the processes, mechanisms and criteria for the HKIE professional accreditation of engineering degree programmes.

Accreditation is a collaborative activity between the profession and the higher education institutions (HEIs). The HKIE works with the HEIs on a continuous basis, to provide assistance, advice and support, to accredit individual programme and to ensure that the accredited programmes are of high quality and meet the needs of professional engineers, their employers and the 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.

1.1 Benefits of Accreditation

The accreditation system is concerned with the criteria and processes for evaluating engineering education programmes leading to the award of professional qualifications. Accreditation by the HKIE provides the following benefits:

- the identification of engineering degree programmes that produce graduates who have attained the academic qualification acceptable for Corporate Membership of the HKIE
- a basis for international comparability of education standards, reciprocal recognition, and graduate mobility
- the academic prerequisite for professional engineer status and/or registration, and consequently is a critical component of individuals' certification by governments and licensing bodies, of competence and safety
- help, advice and support be provided to HEIs to steer the engineering degree programmes to meet the quality standards befitting the needs of professional engineers, employers and Hong Kong society in general

1.2 Engineering Degree Programmes to be Accredited

While the professional accreditation is conducted on a programme basis, HEI is encouraged to consider seeking accreditation of engineering degree programmes within the same academic faculty in one accreditation exercise. Accreditation visit (the visit) normally conducts on Faculty basis. The HKIE considers the overall philosophy, objectives and resources of the academic department, academic faculty and the HEI as equally important as the programme itself. These contextual backgrounds reflect the broad principles and policies of the development of engineering education in a HEI and have a direct impact on the programme development.

Nonetheless, the visit to individual departments to accredit a particular progamme may also be possible subject to the request from the HEI for the purposes of provisional accreditation, considering major modifications to a programme or monitoring the progress of a programme which had been granted accreditation for less than the normal duration, that is, five years.

1.2.1 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 existing programmes with graduates regardless of whether they have been previously accredited or not.

For the provisional accreditation of programmes, the accreditation process should normally commence at least six months before the first cohort of intake has reached halfway of the programmes.

For the full accreditation of programmes, the accreditation exercises may commence at a date mutually acceptable to the HKIE and the HEI after the first cohort of graduates has emerged. The HEI should submit the request for accreditation to the HKIE no later than six months before the visit.

For the reaccreditation of current programmes with the HKIE accreditation status, the HEI should submit the request for reaccreditation at least six months before the expiry of the accreditation status.

1.3 Consultation and Accreditation Visits

The HKIE sees accreditation exercises as a continuous activity. Accordingly, any HEI planning new engineering degree programmes or restructuring existing ones is encouraged to consult the HKIE in order to ensure that the requirements are fully addressed at the development stage of the engineering degree programmes.

1.4 Seeking Accreditation

1.4.1 Eligibility of Institution and Programmes

Non-self-accrediting institution and its engineering degree programmes at the honours level MUST obtain the valid status from the Hong Kong Council for Accreditation of Academic and Vocational Qualifications (HKCAAVQ) or alike before proceeding for the professional accreditation by the HKIE.

1.4.2 Application for Accreditation

The following are the essentials about the application for accreditation.

(a) Initiation of Accreditation Exercises

The accreditation of engineering degree programmes is initiated by the HEI to the HKIE Secretariat (the Secretariat) by writing.

The Secretariat will communicate with the respective programme team of the HEI on the basic information of the programme(s), agree on the proposed date of visit and provide assistance, like briefing to faculty staff, if necessary.

The visit will normally be conducted around six months after receipt of the request for accreditation, but the actual visit dates should be mutually agreed between the HKIE and the HEI.

(b) Briefing to the HEI

Depending on the actual needs of the programme team of the HEI, the Secretariat can provide a briefing on the HKIE accreditation criteria and the logistic arrangements to the HEI either once the visit is confirmed or before the submission of the accreditation documents.

(c) Advisory Visit

For HEI first seeking the accreditation from the HKIE or programmes which are being planned by a HEI, the HKIE may arrange advisory visits by experts as appropriate on a case by case basis, subject to the approval of the Accreditation Board Executive Committee. On such visits, the Visiting Team shall only provide comments and advice on the proposed programmes for reference. The incorporation of such comments and advice into the proposed programmes does not infer the granting of accreditation status by the HKIE.

1.4.3 Costs

Engineering programmes listed as the HKIE accredited degrees incur a fee payable to the HKIE. Engineering degree programmes offered by the UGC-funded institutions will be covered within the scope of the current accreditation contract. The accreditation fee for engineering degree programmes offered by self-funded institutions is charged on programme basis as stipulated by the HKIE.

The HEI will also be responsible for the direct costs of each accreditation exercise, including travel, meals and/or accommodation.

1.4.4 Responsibilities of the HEI

It is the responsibility of the HEI to provide sufficient information for the evaluation by the Visiting Team in the accreditation exercise. The information required includes an accreditation submission covering the background of the HEI, academic faculty, department and the details of the programme(s) seeking accreditation as well as demonstration of the achievement of programme outcomes by direct and indirect measurements. Besides, the HEI is required to table the requested documents for the review by the Visiting Team during the visit. More details on the tabled documents will be presented in later sections.

1.5 Accreditation Exercise

All accreditation exercises normally include visits to the HEIs. It should be noted that the visit is only a part of the accreditation exercise. There is considerable preparation prior to a visit and follow up work after the visit. The essential components of an accreditation exercise are laid out as follows:

1.5.1 Visiting Teams

Visiting Team members are selected on the basis of their expertise and with no direct conflict of interest. Conflict of interest is defined as direct advice provided to the programme to be accredited.

Visiting Team members are required to declare their conflict of interest upon appointment. The HEI will also be informed of the list of Visiting Team members and have the right to raise objection to any member(s) of the Visiting Team should they identify a possible conflict of interest.

(a) Visiting Team Chairman and Members

The Visiting Team shall have a balanced mix of academics and practising professional engineers. All the Visiting Team members have received training/briefing on professional accreditation, and the majority of them will also have prior experience in conducting HKIE accreditation. The Visiting Team Chairman (the Chairman) shall have considerable accreditation experience to lead the Visiting Team.

For an exercise covering a single engineering discipline, the Visiting Team shall normally comprise four members including the Chairman. All members shall be experienced in the discipline or associated with it. Exercises involving two or more programmes that cover more than one engineering discipline shall have at least two members from, or associated with, each of the disciplines.

(b) Assessor

For each accreditation exercise, one member of the Accreditation Board will be appointed to join the visit as an assessor. The assessor is an observer at the visit. He/she will study all the documentation and, in consultation with the Chairman, make recommendations to the Accreditation Board for an accreditation decision.

(c) The HKIE Secretariat

The HKIE Secretariat will accompany the Visiting Team to provide support during the visit.

(d) Observer(s)

Members of the Accreditation Board, representatives from other educational accords' signatories, or representatives from other professional and academic institutions invited by the Accreditation Board may join the visit as observers. Prior consent from the HEI concerned will be sought with the background information of the proposed observer(s) being provided.

1.5.2 Accreditation Submission

The HEI is required to submit an accreditation submission for each programme seeking accreditation. It should be uploaded to the Accreditation Online Platform six weeks before the visit for the review of the Visiting Team. The submission outlines essential information about the HEI, the offering Faculty and the Department, as well as the curriculum and the achievement of the HKIE Graduate Attributes by students and graduates. Before the visit, the Visiting Team may request further information from the HEI after initial review of the submission, if needed.

Please refer to the HKIE submission format for accreditation of engineering degree programmes for more details.

1.5.3 Accreditation Visit

The visit will be conducted by a Visiting Team with expertise relevant to the programme(s) concerned. The accreditation visit is an important component of an accreditation exercise. It is an opportunity for the Visiting Team to better understand the programme(s) to be accredited through arranging interviews with its management, teaching staff, students and other stakeholders. The Visiting Team will also review the facilities and equipment and the tabled documents as requested.

(a) Duration of Accreditation Visit

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

- meetings with the appropriate senior HEI staff;
- meetings with the programme leader and other academic staff;
- meetings with the students and recent graduates;
- meetings with the external stakeholders of the programme;
- tour of the facilities relevant to the programme under accreditation, including lecture theatres, laboratories, library and computing facilities where the respective supporting staff are in attendance;
- review of tabled documents, including examination papers and examination scripts, laboratory instructions, reports and design assignments, project reports and other material demonstrating student performance;
- private meetings of the Visiting Team; and
- an exit meeting with the Dean and senior staff to convey the Visiting Team's initial observations.

The Visiting Team will normally conduct the accreditation visit physically to the HEI. Under the special circumstances, the Visiting Team may conduct the accreditation visit virtually or in mixed mode (physical/virtual) depending on the circumstances at that time. The accreditation visit in virtual/mixed mode may include meeting sessions, tour of facilities and review of students' work via online that require advance preparation of the HEI. Virtual visits for accreditation visits will be considered on a case-by-case basis. The HEIs preparing for accreditation visits must work with the Secretariat to determine the most appropriate format for a visit. Guidance for HEIs to prepare virtual accreditation visits is provided in Appendix II.

(b) Information to be Available During the Visit

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

- evidence of process used to identify educational objectives
- evidence of process used to identify programme outcomes
- 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; final year projects, laboratory reports; external evaluation etc
- evidence of process used to improve the quality of the programme including changes that have been made and/or proposed

(*) To note :

(i) examination question papers and specimen for the last three exams, or since the course commenced, in each course

(ii) marked examination scripts in each course (classify to 3 batches, i.e. Good, Average and Weak, according to the marks) (preferably with 5 samples of each batch)

(iii) assignments, projects, design projects, laboratory reports with the markings (classify to 3 batches, i.e. Good, Average and Weak, according to the marks) (preferably with 5 samples of each batch)

(iv) course materials supplied to students, e.g. course outlines, tutorial sheets, laboratory experiment instruction sheets, prescribed texts, notes, etc

(v) copies of the meeting minutes/records of the relevant Committees/Boards in the past three years, or since the programme commenced (for newly offered programme seeking provisional accreditation), concerning the quality assurance procedures of each programme

(vi) assessment details with results and evaluation for specific programme outcome measurement

The Visiting Team may wish to review some of the above information prior to the on-site visit, for all programmes which have been submitted for accreditation. In this connection, the above information (v) and (vi) will be made available online for the Visiting Team to access at a link provided by the HEI from two weeks before the on-site visit until the end of the visit.

1.5.4 Visit Report

The Chairman prepares the visit report which outlines the observations, commendations, suggestions, recommendations and concerns of the Visiting Team after the visit. The visit report will be sent to the HEI for written response. The Assessor will make reference to the responses from the HEI when propose the accreditation decision in consultation with the Visiting Team Chairman for consideration of the Accreditation Board of the HKIE.

1.6 Accreditation Decisions

1.6.1 Consideration of Accreditation Decisions

The accreditation decisions of engineering degree programmes are considered at the Accreditation Board meeting. The accreditation visit report, the written responses from the HEI, and any other relevant information will be presented to the Accreditation Board for consideration.

Representatives from the HEI concerned, usually the Dean and/or Head of Department will be invited to attend the decision-making session of the Board meeting where their programmes are under consideration.

During the meeting, the Visiting Team Chairman will present the visit report, and the representatives of the HEI will present their responses at the meeting. Members of the Visiting Team may also attend the meeting. The Board may then seek further information or clarification before conducting a private meeting to consider the recommendation of the Assessor and make the accreditation decision.

The accreditation decision of the programmes will be conveyed to the HEI in writing.

1.6.2 Types of Accreditation Decisions and 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.

(a) 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 HEI 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 of the HKIE to granting full accreditation.

(b) 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 period of less than five years, either to bring it in line with the accreditation cycle of other programmes of the same HEI or for early monitoring of a programme on the concerns identified in the accreditation process and/or any conditions/requirements specified in the accreditation decision. Submissions of interim reports are required to address the concerns raised by the Visiting Team. With the recommendation from the Visiting Team Chairman/ representative, Accreditation Board will consider granting a period of accreditation to make up the maximum period of accreditation, i.e. five years.

The Accreditation Board will request a status report for the programme with a full five-year accreditation to address the progress being made on the recommendations provided in the accreditation decision letter. (A template for status report is provided in Appendix III.) The status report will be submitted by the HEI to the Accreditation Board and the Visiting Team Chairman two years before the end of the accreditation period for consideration of any follow up actions that might be necessary.

For a newly developed programme, a full accreditation exercise is mounted, at a time agreed with the HEI, after the first cohort of graduates is produced. Full accreditation, if granted, will retrospectively cover the first cohort of graduates.

(c) Accreditation Refused

If a programme is substantially at variance with the HKIE criteria, the accreditation status is not granted.

(d) Revocation of Accreditation

If a HEI 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, the accreditation can be terminated.

1.7 List of Accredited Programmes

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

1.8 Appeal to Accreditation Decision

The HEI has the right to appeal to the President of the HKIE to review the accreditation decision made by the Accreditation Board. The appeal needs to be raised within three months after the issue of accreditation decision letter.

1.9 Amendments to an Accredited Programme

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 courses;
- a significant change in the provision of resources for the programme.

The HEI should inform the HKIE Accreditation Board of the above and other major curriculum or operational changes in writing within three months after those changes are approved by the HEI. The HEI should provide details of the changes, such as the comparison of the programme outcomes, structure and curriculum, the relevant courses syllabi, and so on, for review. Under such major changes that have been reviewed by the Visiting Team Chairman/representative of the last accreditation visit, the Accreditation Board may then consider any subsequent actions including initiation of a visit or request of a written report, taking into account the recommendations from the Visiting Team Chairman/representative of the last accreditation visit.

As mentioned in Section 1.3, HEI is encouraged to consult the Secretariat on proposed amendments to its existing engineering degree programmes accredited by the HKIE.

1.10 Confidentiality

All documents and information obtained by the Visiting Team during the course of an exercise are kept confidential. Visiting Team members will destroy the information and materials related to the accreditation exercise as provided by the HEI after the completion of the accreditation exercise. One set of the accreditation submission in electronic version will be kept seven years by the HKIE after the completion of the accreditation exercise and will be destroyed afterwards. Regarding the data on student numbers available in the accreditation submission which is anonymous aggregated research data, the HKIE might store and use such information for internal statistical analysis.

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 HEIs 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 HEI must define programme outcomes that are consistent with its 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 learning experience of the students and the programme 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 HEIs to create an environment which can accommodate innovative educational developments and to allow for the expression of the HEI'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 Criteria for the Accreditation of Engineering Degree Programmes

2.3.1 Programme Aims and Objectives

In its submission for accreditation of an engineering degree programme, a HEI 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 HEI should demonstrate how its programmes meet the aims and objectives, and how they can respond to future developments.

2.3.2 Programme Outcomes (The HKIE Required Graduate Attributes)

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 HEI 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) apply knowledge of mathematics, natural science, computer science and engineering appropriate to the degree discipline to develop solutions to complex engineering problems

(b) identify, formulate, research literature and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences with holistic considerations for sustainable development*
(c) design creative and sustainable solutions for complex engineering problems and design systems, components or processes to meet identified needs with appropriate economic, environmental, social, political, ethical, cultural, health and safety, whole-life cost, net zero carbon, manufacturability considerations as required
(d) conduct investigations of complex engineering problems using research methods including research-based knowledge, design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions
(e) create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to support detailed analysis of complex engineering problems, and recognise limitations of such techniques, resources and tools
(f) analyse and evaluate the impact of engineering solutions in a global, economic, environmental and societal context, especially the importance of health, safety, legal, and sustainable development* considerations to both workers and the general public when solving complex engineering problems
(g) apply ethical principles and commit to professional ethics and norms of engineering practice and adhere to relevant national and international laws with the understanding of the need for diversity and inclusion
(h) function effectively as an individual, and in different roles of diverse and inclusive teams and in various settings as needed
(i) communicate effectively and inclusively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, taking into account cultural, language, and learning differences
(j) apply knowledge of engineering management principles and economic decision-making to one's own work, and to manage projects and in multidisciplinary environments
(k) stay abreast of contemporary issues and recognise the need for, and have the preparation and ability for i) independent and life-long learning, ii) adaptability to new and emerging technologies, and iii) critical thinking in the context of technological change

** Represented by the 17 UN Sustainable Development Goals (UN-SDG)*

The interpretation of the above graduate attributes should be consistent with the requirements of the Washington Accord, including the level of problem solving and range of engineering activities. A copy of the Washington Accord Graduate Attributes and Professional Competencies is enclosed as Appendix IV in this Handbook. This is also available at the International Engineering Alliance website: http://www.ieagreements.org.

2.3.3 Programme 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 courses and activities which could contribute further to the education of an engineering undergraduate, but the onus is on the HEI 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 HEI must demonstrate the equivalence of this method with traditional delivery methods.

2.3.4 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.

2.3.5 Syllabus and Curriculum

The HKIE does not wish to impose uniformity on HEIs 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. The curriculum must have an appropriate course sequence and have adequate breadth and depth appropriate to the degree programme, and the HEI must demonstrate that prerequisites are followed.

The HKIE accepts that over the whole range of engineering disciplines it is not possible to state precisely the essential characteristics and content of courses and programmes. However, the HKIE expects the curricula to prepare students in a broad range of engineering subjects, mathematics and complementary support subjects appropriate to the engineering discipline. The HKIE 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 to demonstrate that the graduates have the outcomes that the programme desires.

(a) Mathematics and Basic Sciences

The HKIE considers that the mathematics content should underpin the engineering subjects, and should emphasise mathematical concepts, 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.

(b) Engineering Subjects

(i) Engineering Sciences

Engineering sciences have their roots in mathematics, physics and other basic sciences but carry knowledge further towards creative application. This should start with a systematic, theory-based understanding of natural sciences and 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 HEI to provide engineering courses for the appropriate discipline and others for appreciation of related disciplines to support the educational objectives and desired programme outcomes. In this connection, engagement with selected knowledge in the research literature of the Discipline(s) is expected.

(ii) 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 enable discussion of general design techniques and philosophy, as well as financial, quality, safety, environmental implications and sustainability.

(iii) Health, Safety and the Environment

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

(iv) Laboratory and Field Work

Courses should be supported by meaningful laboratory work, well-coordinated with the lecture materials and supported with relevant up-to-date equipment. If a HEI 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-coordinated 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.

(v) 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.

(c) 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.

(i) Practical Training

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

(ii) 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.

(iii) 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.

2.3.6 Quality Assurance System /Assessment

Assessment of student performance should demonstrate the effectiveness of the learning process in achieving the programme outcomes consistent with the HKIE graduate attributes for engineering degree programmes.

There should be an effective quality assurance system with external benchmarking such as external examiner to maintain and enhance the academic standards of programmes. For each programme outcome, the system should specify its measurement dimensions, the corresponding metric, assessment rubrics, expected standard and targeted benchmark. The system should specify a time schedule to collect evidence for evaluation of each programme outcomes.

2.3.7 Academic Staff

An important factor affecting the standard of an engineering degree programme is the quality and commitment of the teaching staff. Programme leadership and course leadership as appropriate should be clearly defined. The roles and responsibilities of Programme Leader and Course Leader including academic leadership and quality assurance should be understood by all relevant stakeholders. The programme must also demonstrate that they have adequate qualified academic staff consistent with delivering the educational objectives and desired programme outcomes. The qualifications and number of staff are necessary but not sufficient in establishing the appropriateness of the teaching cadre.

2.3.8 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:

(a) Support Staff

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

There should also be adequate administrative and secretariat staff to support the academic staff.

(b) Accommodation and Equipment

There must be adequate provision of lecture rooms, laboratories, workshops, drawing offices and private study areas for 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.

(c) 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.

(d) Information Services

The HEI 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 a wide range of 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.

(e) Financial Resources

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

2.3.9 Students

The HEI should monitor and evaluate the learning experience and performance of the students, and offer timely support such as academic advising, remedial measures, counselling, career planning, etc. befitting the needs of students being admitted to different years of the programmes. Student progress must be monitored to foster success in attaining programme outcomes and the HKIE Graduate Attributes. Policies and mechanisms should be put in place to engage students in the quality assurance process and facilitate students to provide feedback for continuous improvement of the programmes and their learning experience.

2.3.10 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.

2.3.11 Development

The HKIE believes it is incumbent on a HEI 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. For achieving this, HEIs have a responsibility to liaise with the engineering profession and industry in relation to engineering degree programmes and their development.

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 a 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.

Accreditation Concern
A statement that a programme is in lack of compliance with one or more accreditation criterion/criteria, and hence condition(s) will be stipulated for the higher education institution to address by taking appropriate actions prior to the next review.

Recommendation
A statement that a programme currently satisfies all accreditation criteria, but the risk exists for the situation to change such that the criteria may not be satisfied.

Observation/Suggestion
A comment or suggestion that does not relate directly to the accreditation action but is offered to assist the higher education institution in its continuing efforts to improve its programmes.

Guidance for Higher Education Institutions with Virtual / Mixed Mode Accreditation Visits

To ensure an effective virtual / mixed mode accreditation visit that fosters a high level of engagement among participants, this document outlines the protocols that higher education institutions (HEIs) are suggested to follow.

Virtual / Mixed Mode Visit Protocols

1. A virtual or mixed mode accreditation visit must include the same meetings that would have taken place in a face-to-face accreditation visit. The same groups of people who would be met with for an on-site visit should be included in the virtual visit (faculty members, students, external stakeholders, etc).

2. Prior to the visit, a virtual "room" in a privacy compliant application should be established. The Visiting Team should be able to review materials and representative samples of student work that would be available in a face-to-face visit therein. The virtual room with access instructions should be available in advance of the start of the visit, on a date that has been agreed upon by the HEI and the HKIE Secretariat / Visiting Team Chairman.

3. The technology to be used (such as Zoom or Microsoft Teams) should be facilitated and supported by the HEI during the visit. The HEI should provide links on the agenda for each virtual meeting to facilitate attendance of the Visiting Team. The Visiting Team Chairman would be consulted on how the Visiting Team would like to handle private meetings between the Visiting Team Members. For instance, it may use private breakout space to be arranged by the HEI or the HKIE online meeting platform for the Visiting Team meetings.

4. Where a group of participants are in the same room, the room needs to be equipped with appropriate audio equipment such as sufficient microphones that can pick up all participants.

5. Every participant in the visit (both on the HEI side and the Visiting Team side) is expected to be on camera.

6. A virtual tour of the facilities should be included as part of the visit. The Visiting Team Chairman would be consulted on the approach of the tour that may be a live broadcasting tour or a pre-recorded tour. Even though a pre-recorded tour has been arranged as agreed by the Visiting Team Chairman, the Visiting Team could request to view certain facilities through live broadcasting and the HEI should be prepared for the requests.

7. To build in 10- to 15-minute breaks between consecutive meetings, if appropriate.

8. To make IT support available before and during each virtual session to assist with troubleshooting as needed. The role of IT is to provide technical support during the visit. However, they are not required to attend every meeting.

9. To facilitate open and honest discussion and ensure confidentiality is maintained, recording of meetings is not allowed.

Appendix III

Template for Status Report

[Name of Institution]
[Name of Faculty/School/College]

Status Report for the following programme(s)

[Name of Department]	[Name of Programme]

(I) Response to the HKIE's concerns/recommendations – For all programmes concerned

1.	HKIE's concern/recommendation: [………….]	[Addressed/ Work in progress]
	[Response/Actions taken]	
2.	HKIE's concern/recommendation: [………….]	[Addressed/ Work in progress]
	[Response/Actions taken]	
…	…	[Addressed/ Work in progress]

(II) Response to the HKIE's concerns/recommendations – For [Name of Programme(s)]

1.	HKIE's concern/recommendation: [………….]	[Addressed/ Work in progress]
	[Response/Actions taken]	
2.	HKIE's concern/recommendation: [………….]	[Addressed/ Work in progress]
	[Response/Actions taken]	
…	…	[Addressed/ Work in progress]

Completed on [DD-MM-YYYY]

INTERNATIONAL ENGINEERING ALLIANCE

GRADUATE ATTRIBUTES & PROFESSIONAL COMPETENCIES

PROUDLY SUPPORTED BY:

PREAMBLE

The International Engineering Alliance is pleased to announce that all Accords and Agreements have approved revisions to its Graduate Attributes and Professional Competencies (GAPC) international benchmark. The review, supported by UNESCO, was undertaken by a joint IEA-WFEO Working Group who engaged extensively with IEA signatories, WFEO members and WFEO partners representing academics, industry and women globally. They reflect requirements for new technologies and engineering disciplines, new pedagogies and values such as sustainable development, diversity and inclusion and ethics. They are well positioned to support the engineering role in building a more sustainable and equitable world.

Our thanks to UNESCO and WFEO for their constant support and endorsement and to the GAPC Working Group members, who commenced this work three years ago and who have worked tirelessly to bring this to fruition.

VERSION: 2021.1

The documents presented in this compendium are current as of 21 June 2021.

IEA Constituent Agreements

Washington Accord	International Professional Engineers Agreement
Sydney Accord	International Engineering Technologists Agreement
Dublin Accord	APEC Engineer Agreement
	Agreement for International Engineering Technicians

Graduate Attributes and Professional Competences

Approved Version 4: 21 June 2021

This document is available through the IEA website: http://www.ieagreements.org

Executive Summary

Many accrediting bodies for engineering qualifications have developed outcomes-based criteria for evaluating programs. Similarly, many engineering regulatory bodies have developed or are in the process of developing competence-based standards for registration. Educational and professional accords for mutual recognition of qualifications and registration have developed statements of graduate attributes and professional competence profiles. This document, which is a revised version that takes into account the present-day state of engineering activities, presents the background to these developments, their purpose, and the methodology and limitations of the statements. After defining general range statements that allow the competences of the different categories to be distinguished, the paper presents the graduate attributes and professional competence profiles for three professional tracks: engineer, engineering technologist, and engineering technician.

1 Introduction

Engineering is an activity that is essential to meeting the needs of people, economic development and the provision of services to society. Engineering involves the purposeful application of mathematical and natural sciences and a body of engineering knowledge, technology and techniques. Engineering seeks to produce solutions of which the effects are predicted to the greatest degree possible, in often uncertain contexts. While bringing benefits, engineering activity has potential adverse consequences. Engineering therefore must be carried out responsibly and ethically, use available resources efficiently, be economic, safeguard health and safety, be environmentally sound and sustainable and generally manage risks throughout the entire lifecycle of a system. The United Nations Sustainable Development Goals present targets for 2030. Engineers are vital contributors for making progress towards these goals.

Typical engineering activity requires several roles including those of the engineer, engineering technologist and engineering technician, recognized as professional registration categories in many jurisdictions[1]. These roles are defined by their distinctive competences

[1] The terminology used in this document uses the term *engineering* as an activity in a broad sense and *engineer* as shorthand for the various types of professional and chartered engineer. It is recognized that *engineers*,

and their level of responsibility to the public. There is a degree of overlap between roles. The distinctive competences, together with their educational underpinnings, are defined in sections 4 to 6 of this document.

The development of an engineering professional in any of the categories is an ongoing process with important identified stages. The first stage is the attainment of an *accredited educational qualification*, the graduate stage. The fundamental purpose of *engineering education* is to build a knowledge base and attributes to enable the graduate to continue learning and to proceed to formative development that will develop the competences required for independent practice. The second stage, following a period of formative development, is *professional registration*. The fundamental purpose of formative development is to build on the educational base to develop the competences required for independent practice in which the graduate works with engineering practitioners and progresses from an assisting role to taking more individual and team responsibility until competence can be demonstrated at the level required for registration. Once registered, the practitioner must maintain and expand competence.

For engineers, engineering technologists, and engineering technicians, a third milestone is to qualify for the *international register* held by the various jurisdictions. In addition, engineers, technologists and technicians are expected to maintain and enhance competence throughout their working lives.

Several international accords provide for recognition of graduates of accredited programs of each signatory by the remaining signatories. The Washington Accord (WA) provides for mutual recognition of programs accredited for the engineer track. The Sydney Accord (SA) establishes mutual recognition of accredited qualifications for engineering technologist. The Dublin Accord (DA) provides for mutual recognition of accredited qualifications for engineering technicians. These accords are based on the principle of substantial equivalence rather than exact correspondence of content and outcomes. This document records the signatories' consensus on the attributes of graduates for each accord.

Similarly, the International Professional Engineers Agreement[2] (IPEA), the International Engineering Technologists Agreement[3] (IETA), and the Agreement for International Engineering Technicians (AIET) provide mechanisms to support the recognition of a professional registered in one signatory jurisdiction obtaining recognition in another. The signatories have formulated consensus competence profiles for the registration and these are recorded in this document.

Section 2 gives the background to the graduate attributes presented in section 5. Section 3 provides background to the professional competence profiles presented in section 6. General range statements are presented in section 4. The graduate attributes are presented in section 5 while the professional competence profiles are defined in section 6. Appendix A defines terms used in this document. Appendix B sketches the origin and development history of the graduate attributes and professional competence profiles.

2 Graduate Attributes

This section gives background to the graduate attributes presented in section 5.

Purpose of Graduate Attributes

Graduate attributes form a set of individually assessable outcomes that are the components indicative of the graduate's potential to acquire competence to practise at the appropriate

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engineering technologists, and *engineering technicians* may have specific titles or designations and differing legal empowerment or restrictions within individual jurisdictions.

level. The graduate attributes are exemplars of the attributes expected of graduate from an accredited program. Graduate attributes are clear, succinct statements of the expected capability, qualified if necessary, by a range indication appropriate to the type of program.

The graduate attributes are intended to assist Signatories and Provisional Members to develop or review their outcomes-based accreditation criteria for use by their respective jurisdictions. Graduate attributes also guide bodies in developing or revising their accreditation systems with a view to seeking signatory status.

Graduate attributes are defined for educational qualifications in the engineer, engineering technologist and engineering technician tracks. The graduate attributes serve to identify the distinctive characteristics as well as areas of commonality between the expected outcomes of different types of programs.

Limitation of Graduate Attributes

Each signatory defines the standards for the relevant track (engineer, engineering technologist or engineering technician) against which engineering educational programs are accredited. Each educational level accord is based on the principle of *substantial equivalence*; that is, programs are not expected to have identical outcomes and content but rather produce graduates who could enter employment and be fit to undertake a program of training and experiential learning leading to professional competence and registration. The Graduate Attributes provide a point of reference for bodies to describe the outcomes of substantially equivalent qualification. The Graduate Attributes do not, in themselves, constitute an “international standard” for accredited qualifications but provide a widely accepted common reference or benchmark for bodies to describe the outcomes of substantially equivalent qualifications.

Graduate Attributes may be accepted for use within a jurisdiction or adapted to accommodate the context and any specific requirements of the jurisdiction. Where a signatory has adapted or developed their own graduate attributes, it is expected that there is alignment to these Graduate Attributes.

The term graduate does not imply a particular type of qualification but rather the exit level of the qualification, be it a degree or diploma.

Graduate Attributes and the Quality of Programs

The Washington, Sydney and Dublin Accords “recognize the substantial equivalence of … programs satisfying the academic requirements for practice …” for engineers, engineering technologists and engineering technicians respectively. The Graduate Attributes are assessable outcomes, supported by level statements, developed by the signatories that give confidence that the educational objectives of programs are being achieved. The quality of a program depends not only on the stated objectives and attributes to be assessed but also on the program design, resources committed to the program, the teaching and learning process and assessment of students, including confirmation that the graduate attributes are satisfied. The Accords therefore base the judgement of the substantial equivalence of programs accredited by signatories on both the Graduate Attributes and the best practice indicators for evaluating program quality listed in the Accords’ Rules and Procedures[2].

[2] Accord Rules and Procedures. June 2018, section C.4.5. Available at www.ieagreements.org.

Scope and Organization of Graduate Attributes

The graduate attributes are organized using eleven headings shown in section 5.2. Each heading identifies the differentiating characteristic that allows the distinctive roles of engineers, technologists and technicians to be distinguished by range information.

For each attribute, statements are formulated for engineer, engineering technologist and engineering technician using a common stem, with ranging information appropriate to each educational track defined in sections 4.1 and 5.1. For example, for the **Engineering Knowledge** attribute:

> **Common Stem:** Apply knowledge of mathematics, natural science, computing and engineering fundamentals, and an engineering specialization …
>
> > **Engineer Range:** … as specified in the engineer knowledge profile to develop solutions to complex engineering problems.
> > **Engineering Technologist Range:** … as specified in the engineering technologist knowledge profile to defined and applied engineering procedures, processes, systems or methodologies.
> > **Engineering Technician Range:** … as specified in the engineering technician knowledge profile to wide practical procedures and practices.

The resulting statements are shown below for this example:

Engineer Graduate	Engineering Technologist Graduate	Engineering Technician Graduate
Apply knowledge of mathematics, science, computing and engineering fundamentals and an engineering specialization as specified in WK1-WK4 respectively to develop solutions to complex engineering problems.	Apply knowledge of mathematics, science, computing and engineering fundamentals and an engineering specialization as specified in SK1-SK4 respectively to defined and applied engineering procedures, processes, systems or methodologies.	Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization as specified in DK1-DK4 respectively to wide practical procedures and practices.

The range qualifier in several attribute statements uses the notions of *complex engineering problems*, *broadly-defined engineering problems* and *well-defined engineering problems*. These shorthand level descriptors are defined in section 4.1.

The attributes are chosen to be universally applicable and reflect acceptable minimum standards and be capable of objective measurement. While all attributes are important, individual attributes are not necessarily of equal weight. Attributes are selected that are expected to be valid for extended periods and changed infrequently only after considerable debate. Attributes may depend on information external to this document, for example generally accepted principles of ethical conduct.

The full set of graduate attribute definitions is given in section 5.

Contextual Interpretation

The graduate attributes are stated generically and are applicable to all engineering disciplines. In interpreting the statements within a disciplinary context, individual statements may be amplified and given particular emphasis but they must not be altered in substance or individual elements ignored.

Best Practice in Application of Graduate Attributes

The attributes of Accord programs are defined as a *knowledge profile*, which is an indicated volume of learning and the attributes against which graduates must be able to perform. The requirements are stated without reference to the design of programs that would achieve the requirements. Providers therefore are free to design programs with different detailed structures, learning pathways and modes of delivery. Evaluation of individual programs is the concern of national accreditation systems.

3 Professional Competence Profiles

Purpose of Professional Competence Profiles

A professionally or occupationally *competent person* has the attributes necessary to perform the activities within the profession or occupation to the standards expected in independent employment or practice. The *professional competence profiles* for each professional category record the elements of competence necessary for performance that the professional is expected to be able to demonstrate in a holistic way at the stage of attaining registration.

Professional competence can be described using a set of attributes corresponding largely to the graduate attributes, but with different emphases. For example, at the professional level, the ability to take responsibility in a real-life situation is essential. Unlike the graduate attributes, professional competence is more than a set of attributes that can be demonstrated individually. Rather, competence must be assessed holistically.

Scope and Organization of Professional Competence Profiles

The professional competence profiles are written for each of the three categories: engineer, engineering technologist and engineering technician at the point of registration[3]. Each profile consists of thirteen elements. Individual elements are formulated around a differentiating characteristic using a stem and modifier, similar to the method used for the graduate attributes described in section 2.3.

The stems are common to all three categories and the range modifiers allow distinctions and commonalities between categories to be identified. Like their counterparts in the graduate attributes, the range statements use the notions of complex engineering problems, broadly-defined engineering problems and well-defined engineering problems defined in section 4.1. At the professional level, a classification of engineering activities is used to define ranges and to distinguish between categories. Engineering activities are classified as *complex*, *broadly-defined* or *well-defined*. These shorthand level descriptors are defined in section 4.2.

Limitations of Professional Competence Profile

As in the case of the graduate attributes, the professional competence profiles are not prescriptive in detail but rather reflect the essential elements that would be present in competence standards.

The professional competence profiles do not specify performance indicators or how the above items should be interpreted in assessing evidence of competence from different areas of practice or for different types of work. Section 3.4 examines contextual interpretation.

[3] Requirements for the IEPA, IETA, and AIET International Registers call for enhanced competence and responsibility.

Each jurisdiction may define *performance indicators***;** that is, actions on the part of the candidate that demonstrate competence. For example, a design competence may be evidenced by the following performances:

> *1: Identify and analyse a design/planning requirement and draw up a detailed requirements specification*
> *2: Synthesise a range of potential solutions to problem or approaches to project execution*
> *3: Evaluate potential approaches to meet requirements and their possible impacts*
> *4: Fully develop design of selected option*
> *5: Produce design documentation for implementation*

Contextual Interpretation

Although competence can be demonstrated in different areas of practice and types of work, competence statements are independent of, and separate to, any specific discipline. Thus the competence statements accommodate different types of work (for example, design, research and development and engineering management) by using the broad phases in the cycle of engineering activity (problem analysis, synthesis, implementation, operation and evaluation) together with the management attributes needed. The competence statements also include the personal attributes needed for competent performance irrespective of specific local requirements: communication, ethical practice, judgement, taking responsibility and the protection of society.

The professional competence profiles are stated generically and are applicable to all engineering disciplines. The application of a competence profile may require amplification in different regulatory, disciplinary, occupational or environmental contexts. In interpreting the statements within a particular context, individual statements may be amplified and given particular emphasis but must not be altered in substance or ignored.

Mobility between Professional Categories

The Graduate Attributes and Professional Competence for each of the three categories of engineering practitioner (engineer, engineering technologist and engineering technician) define the benchmark route or vertical progression in each category. This document does not address the movement of individuals between categories, a process that usually requires additional education, training and experience. The Graduate Attributes and Professional Competences, through their definitions of level of demand, knowledge profile and outcomes to be achieved, allow a person planning such an attainment to judge the further learning and experience that will be required. The education and registration requirements of the jurisdiction should be examined for specific requirements.

INTERNATIONAL ENGINEERING ALLIANCE

4 Common Range and Contextual Definitions

Range of Problem Identification and Solving

References included are to the Knowledge and Attitude Profile in 5.1

In the context of both Graduate Attributes and Professional Competences:			
Attribute	***Complex Engineering Problems*** have characteristic WP1 and some or all of WP2 to WP7*:*	***Broadly-defined Engineering Problems* have characteristic SP1 and some or all of SP2 to SP7*:***	***Well-defined Engineering Problems*** have characteristic DP1 and some or all of DP2 to DP7*:*
Depth of Knowledge Required	**WP1:** Cannot be resolved without in-depth engineering knowledge at the level of one or more of WK3, WK4, WK5, WK6 or WK8 which allows a fundamentals-based, first principles analytical approach	**SP1:** Cannot be resolved without engineering knowledge at the level of one or more of SK 4, SK5, and SK6 supported by SK3 with a strong emphasis on the application of developed technology	**DP1:** Cannot be resolved without extensive practical engineering knowledge as reflected in DK5 and DK6 supported by theoretical knowledge defined in DK3 and DK4
Range of conflicting requirements	**WP2:** Involve wide-ranging and/or conflicting technical, non-technical issues (such as ethical, sustainability, legal, political, economic, societal) and consideration of future requirements	**SP2:** Involve a variety of conflicting technical and non-technical issues (such as ethical, sustainability, legal, political, economic, societal) and consideration of future requirements	**DP2:** Involve several technical and non-technical issues (such as ethical, sustainability, legal, political, economic, societal) and consideration of future requirements
Depth of analysis required	**WP3:** Have no obvious solution and require abstract thinking, creativity and originality in analysis to formulate suitable models	**SP3:** Can be solved by application of well-proven analysis techniques and models	**DP3:** Can be solved in standardized ways
Familiarity of issues	**WP4:** Involve infrequently encountered issues or novel problems	**SP4:** Belong to families of familiar problems which are solved in well-accepted ways	**DP4:** Are frequently encountered and thus familiar to most practitioners in the practice area
Extent of applicable codes	**WP5:** Address problems not encompassed by standards and codes of practice for professional engineering	**SP5:** Address problems that may be partially outside those encompassed by standards or codes of practice	**DP5:** Addresses problems that are encompassed by standards and/or documented codes of practice
Extent of stakeholder involvement and conflicting requirements	**WP6:** Involve collaboration across engineering disciplines, other fields, and/or diverse groups of stakeholders with widely varying needs	**SP6:** Involve different engineering disciplines and other fields with several groups of stakeholders with differing and occasionally conflicting needs	**DP6:** Involve a limited range of stakeholders with differing needs
Interdependence	**WP 7:** Address high level problems with many components or sub-problems that	**SP7:** Address components of systems within complex engineering problems	**DP7:** Address discrete components of engineering systems

	may require a systems approach		

Range of Engineering Activities

Attribute	Complex Activities	Broadly-defined Activities	Well-defined Activities
Preamble	**Complex activities** means (*engineering)* activities or projects that have some or all of the following characteristics:	**Broadly defined activities** means (*engineering)* activities or projects that have some or all of the following characteristics:	**Well-defined activities** means *(engineering)* activities or projects that have some or all of the following characteristics:
Range of resources	**EA1:** Involve the use of diverse resources including people, data and information, natural, financial and physical resources and appropriate technologies including analytical and/or design software	**TA1:** Involve a variety of resources including people, data and information, natural, financial and physical resources and appropriate technologies including analytical and/or design software	**NA1:** Involve a limited range of resources for example people, data and information, natural, financial and physical resources and/or appropriate technologies
Level of interactions	**EA2:** Require optimal resolution of interactions between wide-ranging and/or conflicting technical, non-technical, and engineering issues	**TA2:** Require the best possible resolution of occasional interactions between technical, non-technical, and engineering issues, of which few are conflicting	**NA2:** Require the best possible resolution of interactions between limited technical, non-technical, and engineering issues
Innovation	**EA3:** Involve creative use of engineering principles, innovative solutions for a conscious purpose, and research-based knowledge	**TA3:** Involve the use of new materials, techniques or processes in non-standard ways	**NA3:** Involve the use of existing materials techniques, or processes in modified or new ways
Consequences to society and the environment	**EA4:** Have significant consequences in a range of contexts, characterized by difficulty of prediction and mitigation	**TA4:** Have reasonably predictable consequences that are most important locally, but may extend more widely	**NA4:** Have predictable consequences with relatively limited and localized impact.
Familiarity	**EA5:** Can extend beyond previous experiences by applying principles-based approaches	**TA5:** Require a knowledge of normal operating procedures and processes	**NA5:** Require a knowledge of practical procedures and practices for widely-applied operations and processes

5 Accord program profiles

The following tables provide profiles of graduates of three types of tertiary education engineering programs. See section 4 for definitions of complex engineering problems, broadly-defined engineering problems, and well-defined engineering problems.

Knowledge and Attitude Profile

A Washington Accord program provides:	**A Sydney Accord program** provides:	**A Dublin Accord program** provides:
WK1: A systematic, theory-based understanding of the **natural sciences** applicable to the discipline and awareness of relevant **social sciences**	**SK1:** A systematic, theory-based understanding of the **natural sciences** applicable to the sub-discipline and awareness of relevant **social sciences**	**DK1:** A descriptive, formula-based understanding of the **natural sciences** applicable in a sub-discipline and awareness of directly relevant **social sciences**
WK2: Conceptually-based **mathematics**, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline	**SK2:** Conceptually-based **mathematics**, numerical analysis, , data analysis, statistics and formal aspects of computer and information science to support detailed consideration and use of models applicable to the sub-discipline	**DK2:** Procedural **mathematics**, numerical analysis, statistics applicable in a sub-discipline
WK3: A systematic, theory-based formulation of **engineering fundamentals** required in the engineering discipline	**SK3:** A systematic, theory-based formulation of **engineering fundamentals** required in an accepted sub-discipline	**DK3:** A coherent procedural formulation of **engineering fundamentals** required in an accepted sub-discipline
WK4: Engineering **specialist knowledge** that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.	**SK4:** Engineering **specialist knowledge** that provides theoretical frameworks and bodies of knowledge for an accepted sub-discipline	**DK4:** Engineering **specialist knowledge** that provides the body of knowledge for an accepted sub-discipline
WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports **engineering design and operations** in a practice area	**SK5: :** Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports **engineering design and operations** using the technologies of a practice area	**DK5:** Knowledge that supports **engineering design and operations** based on the techniques and procedures of a practice area
WK6: Knowledge of **engineering practice** (technology) in the practice areas in the engineering discipline	**SK6:** Knowledge of **engineering technologies** applicable in the sub-discipline	**DK6:** Codified **practical engineering knowledge** in recognized practice area.

WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development*	**SK7 Knowledge** of the role of technology in society and identified issues in applying engineering technology, such as public safety and sustainable development*	**DK7: Knowledge** of issues and approaches in engineering technician practice, such as public safety and sustainable development*
WK8: Engagement with selected knowledge in the current **research literature** of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues	**SK8** Engagement with the current **technological literature** of the discipline and awareness of the power of critical thinking	**DK8:** Engagement with the current **technological literature** of the practice area
WK9: Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes	**SK9: Ethics, inclusive behavior and conduct.** Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes	**DK9: Ethics, inclusive behavior and conduct.** Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes
*Represented by the 17 UN Sustainable Development Goals (UN-SDG)		
A program that builds this type of knowledge and attitude and develops the base attributes listed below is typically achieved in 4 to 5 years of study, depending on the level of students at entry.	A program that builds this type of knowledge and attitude and develops the base attributes listed below is typically achieved in 3 to 4 years of study, depending on the level of students at entry.	A program that builds this type of knowledge and attitude and develops the base attributes listed below is typically achieved in 2 to 3 years of study, depending on the level of students at entry.

Graduate Attribute Profiles

References included are to the Knowledge and Attitude Profile in 5.1.

Differentiating Characteristic	Engineer Graduate	Engineering Technologist Graduate	Engineering Technician Graduate
Engineering Knowledge: Breadth, depth and type of knowledge, both theoretical and practical	**WA1:** Apply knowledge of mathematics, natural science, computing and engineering fundamentals, and an engineering specialization as specified in WK1 to WK4 respectively to develop solutions to complex engineering problems	**SA1:** Apply knowledge of mathematics, natural science, computing and engineering fundamentals and an engineering specialization as specified in SK1 to SK4 respectively to defined and applied engineering procedures, processes, systems or methodologies.	**DA1:** Apply knowledge of mathematics, natural science, engineering fundamentals and an engineering specialization as specified in DK1 to DK4 respectively to wide practical procedures and practices.
Problem Analysis Complexity of analysis	**WA2:** Identify, formulate, research literature and analyze *complex* engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences with holistic considerations for sustainable development* (WK1 to WK4)	**SA2:** Identify, formulate, research literature and analyze *broadly-defined* engineering problems reaching substantiated conclusions using analytical tools appropriate to the discipline or area of specialisation. (SK1 to SK4)	**DA2:** Identify and analyze *well-defined* engineering problems reaching substantiated conclusions using codified methods of analysis specific to their field of activity. (DK1 to DK4)
Design/development of solutions: Breadth and uniqueness of engineering problems i.e., the extent to which problems are original and to which solutions have not previously been identified or codified	**WA3:** Design creative solutions for *complex* engineering problems and design systems, components or processes to meet identified needs with appropriate consideration for public health and safety, whole-life cost, net zero carbon as well as resource, cultural, societal, and environmental considerations as required (WK5)	**SA3:** Design solutions for *broadly-defined* engineering technology problems and *contribute to* the design of systems, components or processes to meet identified needs with appropriate consideration for public health and safety, whole-life cost, net zero carbon as well as resource, cultural, societal, and environmental considerations as required (SK5)	**DA3:** Design solutions for *well-defined* technical problems and *assist with* the design of systems, components or processes to meet specified needs with appropriate consideration for public health and safety as well as cultural, societal, and environmental considerations as required (DK5)

Differentiating Characteristic	Engineer Graduate	Engineering Technologist Graduate	Engineering Technician Graduate
Investigation: Breadth and depth of investigation and experimentation	**WA4:** Conduct investigations of *complex* engineering problems using research methods including research-based knowledge, design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions (WK8)	**SA4:** Conduct investigations of *broadly-defined* engineering problems; locate, search and select relevant data from codes, data bases and literature, design and conduct experiments to provide valid conclusions (SK8)	**DA4:** Conduct investigations of *well-defined* problems; locate and search relevant codes and catalogues, conduct standard tests and measurements (DK8)
Tool Usage: Level of understanding of the appropriateness of technologies and tools	**WA5:** Create, select and apply, and recognize limitations of appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to *complex* engineering problems (WK2 and WK6)	**SA5:** Select and apply, and recognize limitations of appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to *broadly-defined* engineering problems (SK2 and SK6)	**DA5:** Apply appropriate techniques, resources, and modern computing, engineering, and IT tools to *well-defined* engineering problems, with an awareness of the limitations. (DK2 and DK6)
The Engineer and the World: Level of knowledge and responsibility for sustainable development	**WA6:** When solving complex engineering problems, analyze and evaluate sustainable development impacts* to: society, the economy, sustainability, health and safety, legal frameworks, and the environment (WK1, WK5, and WK7)	**SA6:** When solving broadly-defined engineering problems, analyze and evaluate sustainable development impacts* to: society, the economy, sustainability, health and safety, legal frameworks, and the environment (SK1, SK5, and SK7)	**DA6:** When solving well-defined engineering problems, evaluate sustainable development impacts* to: society, the economy, sustainability, health and safety, legal frameworks, and the environment (DK1, DK5, and DK7)
Ethics: Understanding and level of practice	**WA7:** Apply ethical principles and commit to professional ethics and norms of engineering practice and adhere to relevant national and international laws. Demonstrate an understanding of the need for diversity and inclusion (WK9)	**SA7:** Understand and commit to professional ethics and norms of engineering technology practice including compliance with national and international laws. Demonstrate an understanding of the need for diversity and inclusion (SK9)	**DA7:** Understand and commit to professional ethics and norms of technician practice including compliance with relevant laws. Demonstrate an understanding of the need for diversity and inclusion (DK9)
Individual and Collaborative Team work: Role in and diversity of team	**WA8:** Function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multi-disciplinary, face-to-face, remote and distributed settings (WK9)	**SA8:** Function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multi-disciplinary, face-to-face, remote and distributed settings (SK9)	**DA8:** Function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multi-disciplinary, face-to-face, remote and distributed settings (DK9)

Differentiating Characteristic	Engineer Graduate	Engineering Technologist Graduate	Engineering Technician Graduate
Communication: Level of communication according to type of activities performed	**WA9:** Communicate effectively and inclusively on *complex* engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, taking into account cultural, language, and learning differences.	**SA9:** Communicate effectively and inclusively on *broadly-defined* engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, taking into account cultural, language, and learning differences.	**DA9:** Communicate effectively and inclusively on *well-defined* engineering activities with the engineering community and with society at large, by being able to comprehend the work of others, document their own work, and give and receive clear instructions
Project Management and Finance: Level of management required for differing types of activity	**WA10:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.	**SA10:** Apply knowledge and understanding of engineering management principles and apply these to one's own work, as a member or leader in a team and to manage projects in multidisciplinary environments.	**DA10:** Demonstrate awareness of engineering management principles as a member or leader in a technical team and to manage projects in multidisciplinary environments
Lifelong learning: Duration and manner	**WA11:** Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change (WK8)	**SA11:** Recognize the need for, and have the ability for i) independent and life-long learning and ii) critical thinking in the face of new specialist technologies (SK8)	**DA11:** Recognize the need for, and have the ability for independent updating in the face of specialized technical knowledge (DK8)
*Represented by the 17 UN Sustainable Development Goals (UN-SDG)			

6 Professional Competence Profiles

To meet the minimum standard of competence a person must demonstrate that they are able to practice competently, within a practice area, to the standard expected of a reasonable Professional Engineer/Engineering Technologist/Engineering Technician.

The extent to which the person is able to perform each of the following elements in practice area must be taken into account in assessing whether or not the individual meets the overall standard.

Differentiating Characteristic	Professional Engineer	Engineering Technologist	Engineering Technician
Comprehend and apply universal knowledge: Breadth and depth of education and type of knowledge	**EC1:** Comprehend and apply advanced knowledge of the widely-applied principles underpinning good practice	**TC1:** Comprehend and apply the knowledge embodied in widely accepted and applied procedures, processes, systems or methodologies	**NC1:** Comprehend and apply knowledge embodied in standardized practices
Comprehend and apply local knowledge: Type of local knowledge	**EC2:** Comprehend and apply advanced knowledge of the widely-applied principles underpinning good practice specific to the jurisdiction of practice	**TC2:** Comprehend and apply the knowledge embodied procedures, processes, systems or methodologies that is specific to the jurisdiction of practice	**NC2:** Comprehend and apply knowledge embodied in standardized practices specific to the jurisdiction of practice.
Problem analysis: Complexity of analysis	**EC3:** Define, investigate and analyze complex problems using data and information technologies where applicable	**TC3:** Identify, clarify, and analyze broadly-defined problems using the support of computing and information technologies where applicable	**NC3:** Identify, state and analyze well-defined problems using the support of computing and information technologies where applicable
Design and development of solutions: Nature of the problem and uniqueness of the solution	**EC4:** Design or develop solutions to complex problems considering a variety of perspectives and taking account of stakeholder views	**TC4:** Design or develop solutions to broadly-defined problems considering a variety of perspectives.	**NC4:** Design or develop solutions to well-defined problems
Evaluation: Type of activity	**EC5:** Evaluate the outcomes and impacts of complex activities	**TC4:** Evaluate the outcomes and impacts of broadly defined activities	**NC5:** Evaluate the outcomes and impacts of well-defined activities

Differentiating Characteristic	Professional Engineer	Engineering Technologist	Engineering Technician
Protection of society: Types of activity and responsibility to consider sustainable outcomes	**EC6:** Recognize the foreseeable economic, social, and environmental effects of complex activities and seek to achieve sustainable outcomes*	**TC6:** Recognize the foreseeable economic, social, and environmental effects of broadly-defined activities and seek to achieve sustainable outcomes*	**NC6:** Recognize the foreseeable economic, social, and environmental effects of well-defined activities and seek to achieve sustainable outcomes*
Legal, regulatory, and cultural: No differentiation in this characteristic	**EC7:** Meet all legal, regulatory, and cultural requirements and protect public health and safety in the course of all activities	**TC7:** Meet all legal, regulatory, and cultural requirements and protect public health and safety in the course of all activities	**NC7:** Meet all legal, regulatory, and cultural requirements and protect public health and safety in the course of all activities
Ethics: No differentiation in this characteristic	**EC8:** Conduct activities ethically	**TC8:** Conduct activities ethically	**NC8:** Conduct activities ethically
Manage engineering activities: Types of activity	**EC9:** Manage part or all of one or more complex activities	**TC9:** Manage part or all of one or more broadly-defined activities	**NC9:** Manage part or all of one or more well-defined activities
Communication and Collaboration: Requirement for inclusive communications. No differentiation in this characteristic	**EC10:** Communicate and collaborate using multiple media clearly and inclusively with a broad range of stakeholders in the course of all activities.	**TC10:** Communicate and collaborate using multiple media clearly and inclusively with a broad range of stakeholders in the course of all activities.	**NC10:** Communicate and collaborate using multiple media clearly and inclusively with a broad range of stakeholders in the course of all activities.
Continuing Professional Development (CPD) and Lifelong learning: Preparation for and depth of continuing learning. No differentiation in this characteristic	**EC11:** Undertake CPD activities to maintain and extend competences and enhance the ability to adapt to emerging technologies and the ever-changing nature of work.	**TC11:** Undertake CPD activities to maintain and extend competences and enhance the ability to adapt to emerging technologies and the ever-changing nature of work.	**NC11:** Undertake CPD activities to maintain and extend competences and enhance the ability to adapt to emerging technologies and the ever-changing nature of work.
Judgement: Level of	**EC12:** Recognize complexity and	**TC12:** Choose appropriate	**NC12:** Choose and apply appropriate

Differentiating Characteristic	Professional Engineer	Engineering Technologist	Engineering Technician
developed knowledge, and ability and judgement in relation to type of activity	assess alternatives in light of competing requirements and incomplete knowledge. Exercise sound judgement in the course of all complex activities	technologies to deal with broadly defined problems. Exercise sound judgement in the course of all broadly-defined activities	technical expertise. Exercise sound judgement in the course of all well-defined activities
Responsibility for decisions: Type of activity for which responsibility is taken	**EC13:** Be responsible for making decisions on part or all of complex activities	**TC13:** Be responsible for making decisions on part or all of one or more broadly defined activities	**NC13:** Be responsible for making decisions on part or all of all of one or more well-defined activities
*Represented by the 17 UN Sustainable Development Goals (UN-SDG)			

Appendix A: Definitions of terms

Note: These definitions apply to terms used in this document.

Awareness: Recognizing the context and implications while using or applying what has been learned. The demonstration of awareness can be more varied than a demonstration of knowledge. Asking the right questions, including among the assumptions made, complying with or respecting when faced with a situation may be acceptable demonstrations.

Branch of engineering: a generally-recognized, major subdivision of engineering such as the traditional *disciplines* of Chemical, Civil, or Electrical Engineering, or a cross-disciplinary field of comparable breadth including combinations of engineering fields, for example Mechatronics, and the application of engineering in other fields, for example Bio-Medical Engineering.

Broadly-defined engineering problems: a class of problem with characteristics defined in section 4.1.

Broadly-defined engineering activities: a class of activities with characteristics defined in section 4.2.

Complementary (contextual) knowledge: Disciplines other than engineering, basic and mathematical sciences, that support engineering practice, enable its impacts to be understood and broaden the outlook of the engineering graduate.

Complex engineering problems: a class of problem with characteristics defined in section 4.1.

Complex engineering activities: a class of activities with characteristics defined in section 4.2.

Continuing Professional Development: the systematic, accountable maintenance, improvement and broadening of knowledge and skills, and the development of personal qualities necessary for the execution of professional and technical duties throughout an engineering practitioner's career.

Engineering sciences: include engineering fundamentals that have roots in the mathematical and physical sciences, and where applicable, in other natural sciences, but extend knowledge and develop models and methods in order to lead to applications and solve problems, providing the knowledge base for engineering specializations.

Engineering design knowledge: Knowledge that supports engineering design in a practice area, including codes, standards, processes, empirical information, and knowledge reused from past designs.

Engineering discipline: synonymous with *branch of engineering.*

Engineering fundamentals: a systematic formulation of engineering concepts and principles based on mathematical and natural sciences to support applications.

Engineering management: the generic management functions of planning, organising, leading and controlling, applied together with engineering knowledge in contexts including the management of projects, construction, operations, maintenance, quality, risk, change and business.

Engineering problem: is a problem that exists in any domain that can be solved by the application of engineering knowledge and skills and generic competences.

Engineering practice area: a generally accepted or legally defined area of engineering work or engineering technology.

Engineering speciality or specialization: a generally-recognized practice area or major subdivision within an engineering discipline, for example Structural and Geotechnical Engineering within Civil Engineering; the extension of engineering fundamentals to create theoretical frameworks and bodies of knowledge for engineering practice areas.

Engineering technology: is an established body of knowledge, with associated tools, techniques, materials, components, systems or processes that enable a family of practical applications and that relies for its development and effective application on engineering knowledge and competence.

Forefront of the professional discipline/branch[4]: defined by advanced practice in the specialisations within the discipline.

Formative development: the process that follows the attainment of an accredited education program that consists of training, experience and expansion of knowledge.

Knowledge: Recognizing and comprehending terminology, facts, methods, trends, classifications, structures, or theories. It involves learning as well as demonstrating what has been learned. The demonstration of a specific knowledge is invariably by means of work done based on that knowledge.

Manage: means planning, organising, leading and controlling in respect of risk, project, change, financial, compliance, quality, ongoing monitoring, control and evaluation.

Mathematical sciences: mathematics, numerical analysis, statistics and aspects of computer science cast in an appropriate mathematical formalism.

Natural sciences: Provide, as applicable in each engineering discipline or practice area, an understanding the physical world including physics, mechanics, chemistry, earth sciences and the biological sciences,

Practice area: *in the educational context:* synonymous with generally-recognized engineering speciality; *at the professional level:* a generally recognized or distinctive area of knowledge and expertise developed by an engineering practitioner by virtue of the path of education, training and experience followed.

Solution: means an effective proposal for resolving a problem, taking into account all relevant technical, legal, social, cultural, economic and environmental issues and having regard to the need for sustainability.

Subdiscipline: Synonymous with *engineering speciality*.

Substantial equivalence: applied to educational programs means that two or more programs, while not meeting a single set of criteria, are both acceptable as preparing their respective graduates to enter formative development toward registration.

Well-defined engineering problems: a class of problem with characteristics defined in section 4.1.

Well-defined engineering activities: a class of activities with characteristics defined in section 4.2.

[4] This should be distinguished from: **Forefront of knowledge in an engineering discipline/speciality**: defined by current published research in the discipline or speciality.

Appendix B: History of Graduate Attributes and Professional Competence Profiles

The signatories to the Washington Accord recognized the need to describe the attributes of a graduate of a Washington Accord accredited program. Work was initiated at its June 2001 meeting held at Thornybush, South Africa. At the International Engineering Meetings (IEM) held in June 2003 at Rotorua, New Zealand, the signatories to the Sydney Accord and the Dublin Accord recognized similar needs. The need was recognized to distinguish the attributes of graduates of each type of program to ensure fitness for their respective purposes.

The Engineers Mobility Forum (EMF) and Engineering Technologist Mobility Forum (ETMF)[5] have created international registers in each jurisdiction with current admission requirements based on registration, experience and responsibility carried. The mobility agreements recognize the future possibility of competence-based assessment for admission to an international register. At the 2003 Rotorua meetings, the mobility fora recognized that many jurisdictions are in the process of developing and adopting competence standards for professional registration. The EMF and the ETMF therefore resolved to define assessable sets of competences for engineer and technologist. While no comparable mobility agreement exists for technicians, the development of a corresponding set of standards for engineering technicians was felt to be important to have a complete description of the competences of the engineering team.

Version 1
A single process was therefore agreed to develop the three sets of graduate attributes and three professional competence profiles. An International Engineering Workshop (IEWS) was held by the three educational accord and the two mobility fora in London in June 2004 to develop statements of Graduate Attributes and International Register Professional Competence Profiles for the Engineer, Engineering Technologist and Engineering Technician categories. The resulting statements were then opened for comment by the signatories. The comments received called for minor changes only.

The Graduate Attributes and Professional Competences were adopted by the signatories of the five agreements in June 2005 at Hong Kong as version 1.1.

Version 2
A number of areas of improvement in the Graduate Attributes and Professional Competences themselves and their potential application were put to the meetings of signatories in Washington DC in June 2007. A working group was set up to address the issues. The IEA workshop held in June 2008 in Singapore considered the proposals of the working group and commissioned the Working Group to make necessary changes with a view to presenting Version 2 of the document for approval by the signatories at their next general meetings. Version 2 was approved at the Kyoto IEA meetings, 15-19 June 2009.

Version 3
Between 2009 and 2012 a number of possible improvements to the graduate attributes were recorded. During 2012 signatories performed an analysis of gaps between their respective standards and the Graduate Attribute exemplars and by June 2013 most signatories reported substantial equivalence of their standards to the Graduate Attributes. This will be further examined in periodic monitoring reviews in 2014 to 2019. In this process a number of improvements to the wording of the Graduate Attributes and supporting definitions were identified. The signatories to the Washington, Sydney and Dublin Accords approved the changes resulting in this Version 3 at their meetings in Seoul 17-21 June 2013. Signatories stated that the objectives of the changes were to clarify aspects of the Graduate Attribute exemplar. There was no intent to raise the standard. The main changes were as follows:

- New Section 2.3 inserted;
- Range of problem solving in section 4.1 linked to the Knowledge Profiles in section 5.1 and duplication removed;

[5] Now the IEPA and IETA respectively.

- Graduate Attributes in section 5.2: cross-references to Knowledge Profile elements inserted; improved wording in attributes 6, 7 and 11;
- Appendix A: definitions of *engineering management* and *forefront of discipline* added.

Version 4

An agreement was signed at the IEAM 2015 for International Engineering Technicians. The Agreement for International Engineering Technicians (AIET) establishes an international benchmark standard for a practicing qualified engineering technician. An agreement now exists for technicians so that the standards included among Professional Competence Profiles for an engineering technician can be applied.

A UNESCO WFEO IEA Working Group was established in November 2019 following the renewal of the WFEO-IEA MoU and the Declaration on Engineering Education that was made in Melbourne at WEC2019. The Working Group has reviewed the Graduate Attributes and Professional Competences in order to ensure that they reflect contemporary values and employer needs, cover diversity and inclusion and ethics to reflect current and emerging thinking, address the intellectual agility, creativity and innovation required of engineering decision making as well as equip engineering professionals of the future to incorporate the practices that advance the United Nations Sustainable Development Goals (UN SDG). The main changes that resulted from the surveys, research, dissemination and consultation efforts during 2019-2021 were as follows:

- There were changes in all tables on Range of Problem Solving, Range of Engineering Activities, Knowledge and Attitude Profile, Graduate Attributes, and Professional Competence Profiles. These consisted of additions of new attributes as well as enhancements of the already existing ones. Some improvements in the wording and in clarity has also been a concern.
- Knowledge and Attitude Profile, Graduate Attributes, and Professional Competence Profiles Tables now refer to UN SDG. These references are intended to provide context for curriculum designers and for professional engineers seeking registration. They represent an internationally accepted example of how sustainability issues can be concisely understood and presented.
- Two rows on “Consequences, Judgement” at the end of Table 4.1 Range of Problem Solving that refer to Professional Competences are deleted as no differentiation was deemed necessary among the three categories.
- A new row of “Ethics, inclusive behavior and conduct” is introduced in the Knowledge Profile table, the name of which has been changed to the Knowledge and Attitude Profile.
- The breadth required of engineering education has been widened to emphasize digital literacy, data analysis, UN SDG, knowledge of relevant social sciences.
- Two rows of Graduate Attributes on “The Engineer and Society” and “Environment and Sustainability,” which have been based on the same knowledge profile have been combined under the heading “The Engineer and the World,” also supplementing the required knowledge profile.
- Knowledge and awareness of ethics, diversity, and inclusion have been emphasized.
- Critical thinking, innovation, emerging technologies, and lifelong learning requirements have been highlighted.
- The necessitated similar changes to Professional Competences have also been made.

The proposed revisions were introduced and discussed by member organizations through a series of extensive consultations, also through webinars organized by WFEO, in IEAM 2020 by IEA members, and via consultation web pages.

Document & Version Control

Version/Effective From	Summary of Changes	Approved	Minutes
2021.1 / Effective from 21 June 2021	Comprehensive review undertaken by joint working group to revise previous version (2013).	Approved by IEA Members (Signatories and Authorised Members) at IEAM June 2021 Use of WFEO & UNESCO Logos approved via email following meetings.	IEA21- IEA Forum Session