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Accreditation of Engineering Degree Courses in Hong Kong*

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The Hong Kong Institution of Engineers, is a statutory body, accrediting all engineering degree programs in Hong Kong for Corporate Members and within the Washington Accord. This paper illustrates the Hong Kong accreditation system and explains how it works to achieve the international standards of quality assurance required by the Accord. It attempts to elaborate on the recent developments in the Hong Kong Special Administrative Region, and explores its relationship with engineering practice in the neighboring economies. At the end of the paper, the author submits his views on the interactions between HKSAR and other parts of the world in accreditation activities, including Mainland China.

INTRODUCTION

IN THE LATE 1980's, accreditation bodies for engineering education in various English speaking countries agreed to accept that their accreditation systems were largely equivalent and the Washington Accord was signed between the USA, Canada, the United Kingdom, Ireland, Australia and New Zealand in 1988. Under the Washington Accord, each signatory recognizes the engineering degrees accredited by other signatories of the Accord. In the early 1990s, the HKIE began to look into the possibility of joining the Washington Accord and a Working Party on Accreditation was formed in 1992 to prepare the groundwork for the establishment of an accreditation board.

In June 1993 the Accreditation Board was established with full efforts made in preparing the criteria and procedures for accreditation activities. In devising the HKIE accreditation system, the following key issues were perceived by the Accreditation Board:

1. The necessity of setting up general engineering criteria against discipline-specific criteria.
2. The need of a check and balance mechanism in the decision-making system.

As the engineering programs offered by universities in Hong Kong were not significantly large in number, the Accreditation Board considered a general engineering approach. For discipline-specific issues in accreditation, the Accreditation Board decided that discipline experts should be involved in the accreditation exercises and overseas experts from various disciplines should be invited from time to time to supplement local expertise. In accreditation decision making, an assessor system was adopted. An assessor had to be a member of the Accreditation Board who would participate in a visit, assess the outcome of the visit and make recommendations to the Accreditation Board. This provided for a check and balance mechanism where the recommendations were made by the assessor rather than the Visiting Team Chairman. This system was proved very successful in maintaining objective decision-making.

In 1994, the HKIE withdrew its membership as an affiliate body in the Engineering Council, United Kingdom with the eminent change of sovereignty. The HKIE had to take over responsibility for accreditation of engineering courses in Hong Kong. In December 1994 the HKIE Council passed the resolution that Engineering Degree Courses accredited prior to 31 December 1994 would continue to be recognized by the HKIE whereas new courses would require accreditations by the Accreditation Board after 1 January 1995. In addition, re-accreditation of courses would be required on expiry of the validity of accreditation. Therefore, the HKIE was ready to undertake accreditation of engineering degree programs to satisfy the academic requirements for Corporate Membership of the HKIE and the Washington Accord.

In June 1995, the HKIE signed the Washington Accord in Dublin, which was subsequently ratified by the other signatories. In 1997, a comprehensive review of the experience gained in the first cycle of accreditation was made. The accreditation criteria and procedures were improved. Faculty-based visits were established which enhanced the efficiency of accreditation operation.

THE ACCREDITATION SYSTEM

The accreditation system of the HKIE is managed by the Accreditation Board and it is the

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policy-setting and decision-making authority governing the operations of the whole system. The key elements of the system includes the Accreditation Board, the accreditation criteria and the accreditation polices and procedures.

The Accreditation Board

It is the policy of the HKIE to develop and maintain an accreditation system at international level. Also, as Hong Kong is an international city situated at a cross road between East and West, Hong Kong must adopt the best practice in engineering education and training in the region. The Accreditation Board consists of 18 members with three from overseas. The membership of the Accreditation Board is drawn from academe and industry with a balance of affiliations in covering most disciplines in the HKIE. The Accreditation Board serves as the governing body in the accreditation system. Currently, there are two committees under the Board, the Accreditation Committee for Higher Diploma Programs and the Accreditation Committee for Computer Science Programs. Accreditation for Computer Science Programs is a service provided by the HKIE to universities and does not relate to its membership nor the Washington Accord.

The accreditation criteria

The accreditation criteria set by the HKIE is in line with other signatories of the Washington Accord. The criteria are a general engineering criteria rather than discipline-specific criteria. It provides an expectation to engineering programmes not only in curriculum but also in programme aims and objectives, academic staff, students, resources and facilities, quality assurance systems and programme development and amendments [1].

A summary of the key elements in the criteria is shown below:

1. *Aims and objectives of engineering programmes.* It is expected that a university should demonstrate how its programmes could meet the aims and objectives and how they could respond to further advances and developments of the engineering technology.
2. *Curriculum requirements.* The HKIE expects an engineering programme to include around 16% mathematics, 60% engineering subjects and 20% complementary studies:

- Mathematics included in a programme must attain a level to facilitate prediction and analysis of all engineering situations within the programme.
- Engineering subjects must include engineering science and technology subjects which support a programme of a particular discipline. Laboratory and field work must be employed to support teaching whereas students are expected to acquire adequate computer capability to analyse, simulate and resolve engineering problems and for learning of engineering performance and concepts. Engineering design and synthesis is an important element in an engineering programme and due emphasis must be given in a programme. The HKIE believes the project work could coordinate all subject matters in a programme and students should perform an appropriate group project to practice human relationship skills in project management. Its assessment should be an important factor in the final award.
- Complementary studies provide students with an appreciation of wider issues relevant to a professional engineer which may include public health and safety, presentation and protection of the environment, law and finance, management and economics, and communications and presentations. On completion of the programme, students should appreciate the role of the professional engineer in society and the responsibilities towards the profession, employers, clients and the public.

3. *Academic staff.* Academic staff responsible for delivering of an engineering programme should be well qualified and actively involved in research, development and scholarly activities. In addition, they are expected to be involved in the institutional activities, thus avoiding isolation from the current practice.
4. *Students.* Intake standard and procedures are considered important. The HKIE requires a university to submit its intake requirements and the actual intake analysis for visiting team's consideration. The HKIE expects engineering programmes to attract a high proportion of the most able students. In addition, student's performance on examinations, assignments and projects should be properly monitored.
5. *Resources and facilities.* The provision of engineering programmes rely on an adequate provision of supporting human, administrative and teaching resources including information services, laboratories, computing facilities, finance and so on. Adequate provisions should be available to the programmes.
6. *Quality assurance system.* The HKIE believes that an independent quality assurance system such as independent external examiner system or equivalent is essential to maintain the academic standards of engineering programmes. In addition, it is also important that quality assurance mechanisms are in place in different levels of the operations in an engineering programme.
7. *Programme development and amendments.* It is expected that from time to time there will be evolutionary changes to a programme within the period of its accreditation. The university concerned should inform the HKIE of major curriculum changes. The Accreditation Board may then consider any subsequent actions including initiation of a visit or request of a written report.

Accreditation polices and procedures

1. *Pre-visit arrangement.* Accreditation is performed in the form of a visit. A visit is initiated at the request of a university about six months before the date of the visit. The Secretariat will confirm the visit date and make arrangements with the university. The Accreditation Board chairman appoints the members of the visiting team, based on a database of visitors, on nomination by the University, on input from the Secretariat and other Board members. Emphasis is given to forming a balanced team in terms of the background and disciplines of the members. An accreditation submission format is available to the university seeking accreditation, and this forms the basis upon which it compiles the submission(s) [2].
2. *The visit.* The visit normally spans three days. The first evening is devoted to a pre-visit team meeting at which the visiting team chairman and assessor appointed by the board will discuss with the visiting team members issues arising from their review of the documentation. The second morning is devoted to reviewing key issues such as the quality assurance system of the university and the department(s), curriculum content, and the quality of intakes and of graduates. The second afternoon is devoted to reviewing students, graduates and the facilities of the program(s). The third day is devoted to student work review and conclusion of the visit. At the end of the visit, an oral report of observations made is conveyed to the Dean/staff of the program(s) under review [2].
3. *Quality assurance.* The visiting team chairman is responsible for preparing the report after a visit with the support of the HKIE secretariat. This report is circulated to visiting team members for comment before the finalized report is submitted to the university. The visit report and the response from the university are sent to the Accreditation Board for deliberation. One characteristic of the HKIE accreditation system is that an Assessor is responsible for monitoring the visit and he/she, in consultation with the Visiting Team Chairman, is formally responsible for preparing the recommendations to the Accreditation Board. The Assessor must be a Member of the Accreditation Board who is familiar with the policy and procedures of the Board. This provides a check and balance mechanism wherein the Assessor objectively assesses the process and helps to determine the outcome of the visit [2].

Accreditation decision

Having received the recommendations from the Assessor, the Accreditation Board will enter into the decision-making process with four options:

1. *Provisional accreditation.* Provisional accreditation may be granted to programs which are under development and which have not yet produced the first cohort of graduates. Provisional accreditation provides an indication to both the university and prospective students that the program is well structured and has good possibilities of receiving full accreditation.
2. *Accreditation for a period of up to five years.* The Board may grant full accreditation for a period of five years. Alternatively, it may grant full accreditation for a term of less than five years, either to bring it in line with the accreditation cycle of the programs of a university, or to monitor developments in a program in relation to the conditions, requirements or concerns which have been raised as a result of the accreditation process [2]. For a newly developed program, a full accreditation exercise is mounted, at a time agreed with the university, after the first cohort of students has graduated. Full accreditation, if granted, will be retrospective to cover the first cohort of graduates [2].
3. *Accreditation refused or withdrawn.* If a program is substantially at variance with the HKIE criteria, then accreditation can be refused or withdrawn. Such a decision is serious and the Accreditation Board will work with a university to try to avoid it. In the event of a decision by the Accreditation Board to refuse or terminate accreditation of a degree program, the university concerned has the right to appeal to the President of the HKIE to review the decision [2].
4. *Consistency of decisions.* The vice-chairman of the Board has the formal role for seeing that accreditation decisions across programs and universities are consistent. The Board formally discusses and considers the question of consistency in its decision-making process [2].

RECENT DEVELOPMENTS

Faculty-based visits

As far as is practicable, the HKIE intends to group different programs of a faculty in an accreditation visit and performs accreditations on a faculty basis. This could significantly save time and efforts of both the HKIE and the universities. In this respect, the HKIE through the experience gathered in the past years has trained sufficient number of visiting team chairmen who would have the expertise in handling faculty-based visits.

Credit-based system

In recent years, universities in Hong Kong have started to adopt a credit based-system to the curricula structure of their programs. During this transition period, a university in its submissions for accreditation has to submit information of the curricula structure on a credit-based and a comparison to existing curricula. The visiting team, in assessing credit-based curricula has to take

additional checks, such as credit units taken by the students and the policy on credit transfer.

Domain of engineering

During accreditation exercises, certain occasions have been occurred when there are different views and opinions on the domain of engineering. One example was a computer science program which intended to seek accreditation from the HKIE and the Accreditation Board had to decide whether a computer science program is an engineering program. Subsequently, it was decided by the Accreditation Board that a computer science program is not an engineering program. In this respect, the Accreditation Board maintains a close relationship with other signatories of the Washington Accord to keep breast with latest practice and current trends in accreditation.

ACCREDITATION AND ENGINEERING PRACTICE

Accreditation provides quality assurance on engineering graduates in Hong Kong. Thus, the academic requirements of the potential professional engineers are properly secured. The HKIE then provides structured training programs to these engineering graduates. On completion of the training programs, these graduates will be required to acquire responsible experience and to take professional assessment of the HKIE before they could be qualified as Corporate Members.

Accreditation of engineering programs forms the objective yardstick to evaluate the academic standards for Corporate Members in the HKIE. Other academic results are then evaluated based upon the accreditation criteria of the HKIE. For example, an engineering graduate from countries other than the Washington Accord signatories will have his/her academic qualifications assessed by the Education and Examination Committee of the HKIE using the accreditation criteria.

INTERACTIONS WITH OTHER PARTS OF THE WORLD

Hong Kong is an international city and it is always eager to assimilate the best practice from different parts of the world. Regular liaison with Washington Accord countries are made, including observation and participation of accreditation visits, decision-making meetings, Washington Accord meetings and other accreditation activities. The current accreditation system of the HKIE has adopted the best practice from other signatories which are relevant to the local environment of Hong Kong. The use of faculty-based visits has enabled a highly efficient system to be run with minimum resources while the use of an assessor system has provided a check and balance mechanism in the accreditation decision making. Both of them were adopted from practices of other signatories. The recent trend of engineering accreditation appears to move towards output-based accreditation, for example the ABET 2000 Criteria which is output based [3]. The HKIE is keeping a close watch on the development for other signatories, with a view to making any necessary improvement in future.

In addition, liaison between the HKIE and institutions in the mainland and in other economies has been very active. The HKIE is willing to share its expertise in accreditation and professional practice to institutions in the mainland and in the region. However, the HKIE is fully aware that the current system in other places is still very different from Hong Kong and their institutions may not be able to directly adopt the HKIE practice without substantial modifications.

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