Where credit is due

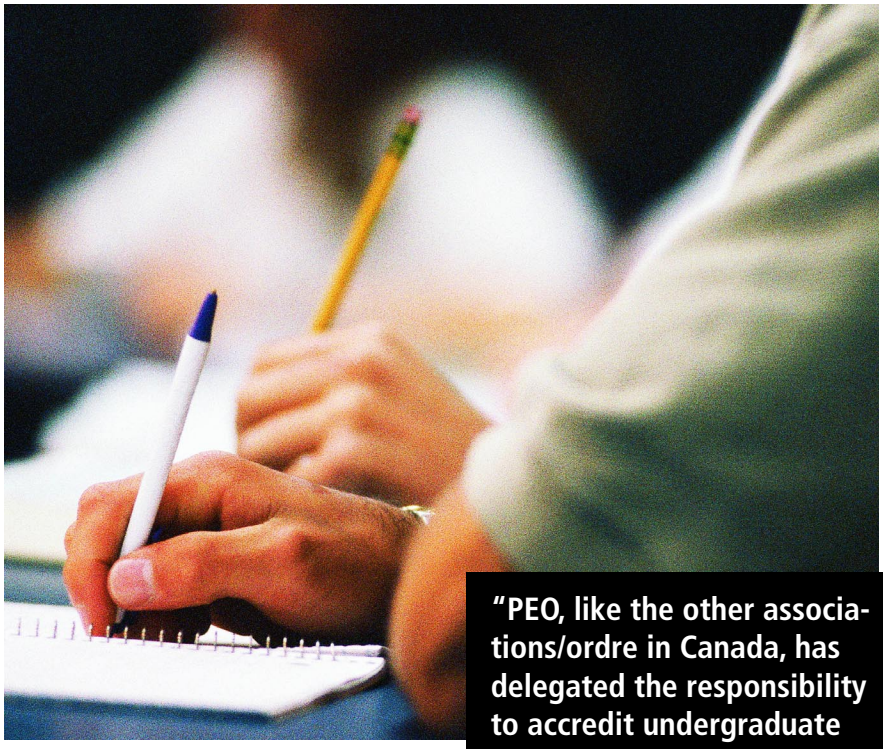
The Canadian Engineering Accreditation Board maintains strict guidelines for evaluation of engineering programs.

by Joan Bailey

In 2001, the Canadian Engineering Accreditation Board (CEAB) accredited seven new engineering programs. They include three software engineering programs at McMaster University, the University of Ottawa and the University of Western Ontario (Western). Computer engineering programs received accreditation at Western and the University of New Brunswick. Integrated engineering was sanctioned at Western and oil and gas engineering at the University of Calgary. Last year only the computer engineering program at University of British Columbia received accreditation; in 1999 materials engineering at the University of Alberta was the lone new program to join the pool. In a system where CEAB would accredit on average one new program a year, this spate of new programs is drawing attention to the accreditation process as a distinctive feature of the licensing process for Canadian engineers.

As well, it is likely that new programs will follow in the bioengineering field. Bioengineering, the integration of engineering science and the biological sciences, has grown in its profile as an engineering discipline, and progress in the Human Genome project has increased media coverage and public interest in the use of biotechnology to improve our quality of life. Technologies borne of this discipline are mutating and multiplying, yet according to John Runciman, PhD, P.Eng., an assistant professor at the University of Guelph's School of Engineering, most of the people who now consider themselves bioengineers graduated from other engineering disciplines (see *Engineering Dimensions,* May/June 2001, p. 30). PEO has set up a bioengineering task group to define the areas of practice, and core body of knowledge for practitioners.

As long as engineers can think of ways to apply the discoveries of science, the number of new engineering disciplines will continue to increase. Here is the process CEAB will use to accredit each of the undergraduate engineering programs in those disciplines.



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Accreditation goals

Fundamentally, the process of accrediting or re-accrediting programs has not changed since CEAB was established in 1965 by the Canadian Council of Professional Engineers (CCPE) to develop national standards for Canadian undergraduate engineering programs. Graduation from a CEAB-accredited program fulfils the academic requirements for licensing by regulatory associations such as PEO. This is an administrative convenience for the associations so that they no longer have to individually assess the transcripts of graduates from CEAB programs. It remains a legislated responsibility of each association to assess whether an individual has fulfilled licensing requirements, however. It is possible that an association could choose not to accept a CEAB program accreditation as sufficient to fulfil its academic requirement.

Norman Williams, PhD, P. Eng., deputy registrar, admissions, noted, "PEO, like the other associations/ordre in Canada, has delegated the responsibility to accredit undergraduate engineering programs to the CEAB through the CCPE. The system is working reasonably well and PEO is satisfied with CEAB's accreditation process."

With the influx of many immigrants into Ontario, more than 30 per cent of professional engineer licence recipients have completed their academic training elsewhere. Some of them may have met the academic requirements as if they were graduates of CEAB accredited programs via Mutual Recognition Agreements

(MRAs) developed between the representatives of the engineering organizations in their countries of study and CCPE. These agreements deem the process of such programs to be substantially equivalent academically to the CEAB process (see sidebar on Foreign Education, p. 31). However, Williams noted, "PEO reviews the applicant's academic qualifications with a view to exempt the applicant from examinations in the event that there are no anomalies in the applicant's education when compared to the respective CEAB-accredited program."

CEAB accredits only individual engineering programs that lead to baccalaureate (bachelor's) degrees, rather than departments or engineering faculties. There are currently 220 accredited programs at 35 institutions across Canada.

To be eligible for CEAB accreditation, a program of study must include the word engineering in its title, and the title must accurately describe the curriculum content. If the program is subject to two or more accreditation requirements, for example materials and metallurgical engineering, it must meet accreditation requirements for each engineering program named. Accreditation is granted in the first year in which the program will graduate students.

The accreditation assessment is begun only at the invitation of the university offering the program to be accredited. The accreditation visit usually takes place in October or November and the CEAB Secretariat must receive a request from the university for such a visit by January 1 of that year.

The visiting team

Before an accreditation visit, the university must complete a questionnaire reporting on organization of the engineering unit, the curriculum, the financial control of the faculty, the policy for staff development, the computing and library facilities, etc. The university has to show that the proposed degree program meets the established academic requirements for licensing as a professional engineer in the broad areas of mathematics, basic sciences, engineering sciences, engineering design and complementary studies.

The visiting team evaluates the accreditation. It is made up of a CEAB-selected chair who is a current or former CEAB member and at least one P. Eng. expert for each of the programs to be accredited. (The CEAB comprises 13 to 15 volunteer professional engineers drawn from across Canada from each of the engineering disciplines. A member can serve three, three-year terms, for a maximum of nine years.)

Visitors usually hold a doctorate degree, but can hold master's degrees if they have "excellent curriculum knowledge," according to Deborah Wolfe, P. Eng., director, educational affairs, CCPE. However, in cases where there is no established course in the new discipline, a P.Eng. expert in a related discipline would be included on the visiting team. So, for example, where computer engineering grew out of electrical engineering, experts in that field were used to evaluate the new programs.

An accreditation visiting team must also have a "general visitor," and this is where, in Ontario, PEO's direct input comes in. General visitors are professional engineers selected by the regulatory engineering association in the province where the university is located. General visitors cannot be employed in an academic environment or have professional or social involvement with the university to be visited. General visitors are non-academic observers and provide a broader perspective to the evaluation of the engineering education offered by the university under review.

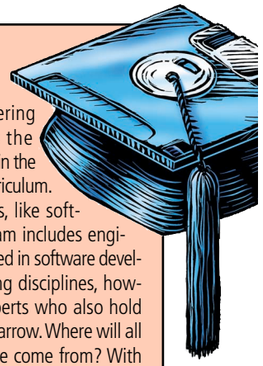
Visits normally take two and a half days to complete, during which visitors conduct interviews with senior administrative officers, faculty members and students to evaluate the professional attitudes, morale, and the balance of opinions concerning theoretical and practical elements of the curriculum. Visiting teams assess the physical facilities, such as laboratories and libraries, and review laboratory instruction sheets, examination papers, student reports, etc.

After an accreditation visit, the visiting team prepares a report highlighting such points as strengths and weaknesses and conformity to CEAB criteria. At this point, no recommendations for accreditation are made. The university receives a copy of the visiting team's report and is given the opportunity to make any clarifications.

Crossing the Ts

When CEAB meets in the June following the team visits to decide whether to accredit the program, the university's dean of engineering is invited to attend. CEAB reviews all of the paperwork, the completed questionnaire, the visiting team's report, and any other relevant information, and the dean is given the opportunity to update any information and answer any questions that CEAB members might have. However, the dean is not privy to the Board deliberation. Once CEAB has reached a decision, it is subjected to a consistency report, which compares the results of the visit and the decision to similar decisions, to ensure consistency. The information is then sent to the university's president and dean, and the dean receives a comprehensive report of the decision by June 30. The university is expected to inform students and staff of the process of accreditation and of the accreditation status of the program.

Accessing other experts



Accrediting engineering programs requires the knowledge of experts in the field to assess the curriculum. With new disciplines, like software, the visiting team includes engineers who have worked in software development. For emerging disciplines, however, the pool of experts who also hold the P.Eng. licence is narrow. Where will all the expert knowledge come from? With visiting teams comprised exclusively of professional engineers, the challenge to find qualified people will increase.

The Ontario Software Engineering Task Force (OSWET) has suggested that CEAB allow non-P.Eng. scientific experts on the visiting teams rather than establish other accreditation boards for new or emerging disciplines. OSWET chair George Comrie, P.Eng., says that the academic requirement for licensure defines a body of knowledge. What are the things that an engineer in this discipline has to know? What is the area of practice? Scientific experts in the field of study will have that knowledge. It is important to have the input of these experts in fields where engineering is just getting involved, he says.

Peter DeVita, P. Eng., past president of PEO, agrees: "Engineering is not a world unto its own. It depends on science." He says that, in emerging disciplines, the scientists who developed the knowledge and techniques need to teach it to engineering licensure candidates and engineering students. Having non-P.Eng. experts on the visiting teams is only one part of the solution to fill the knowledge gap, says DeVita. Engineering schools need these scientists on the engineering faculties.

Foreign Education

If you are a student considering doing your studies elsewhere and returning to Canada to work, there are a few options. Accredited engineering programs from institutions in Australia, Ireland, New Zealand, the United Kingdom, and the United States are recognized as substantially equivalent to Canadian-accredited programs. In 1989 the accreditation bodies in these countries signed Mutual Recognition Agreements with CCPE, agreeing that their systems are substantially equivalent. Recognition is normally granted to graduates from 1989 onward. Graduates of South Africa engineering institutions from 1999 are recognized, as are those who have graduated since 1995 from Hong Kong's Institution of Engineers-accredited programs. The Mutual Recognition Agreements mean the provincial associations/ordre review the academic qualifications with a view to waive examinations for graduates from countries that are part of the agreement. Licensure candidates are not exempt from any of the other requirements. A CCPE agreement is also in force with France, as of 1999, however, PEO has not approved this agreement because it did not afford PEO professional engineers who are not graduates of a CEAB-accredited program the same privilege extended to those who are graduates of a CEAB-accredited program.

Substantial equivalency has been granted to the civil engineering, electrical engineering and industrial engineering programs at the Universidad de Costa Rica.

For graduates outside of these exceptions, academic requirements are assessed on an individual basis. Some graduates from outside Canada will be assigned technical exams to confirm an appropriate level of knowledge in their discipline compared to that provided by the respective CEAB-accredited program. Applicants who hold a Canadian postgraduate degree in the same engineering field may have their confirmatory examination program waived. Also, if they have more than five years of engineering experience, they are given the opportunity to demonstrate their engineering knowledge through a personal interview. Recent experience at PEO is that over 50 per cent of applicants who are interviewed have their confirmatory examination program waived.

Engineering programs are accredited for a specified time period, which ends June 30 of the specified year. The maximum period of accreditation is six years.

In development

Re-accreditation of accredited programs follows the same process as initial accreditation. However, CEAB recognizes that new programs can benefit from its guidance at an early stage, depending on how the program has developed. CEAB has identified six ways in which a new program can develop. They can arise as:

- a new program from an established discipline in an established school;
- a new program from a previous option at an established discipline and school;
- a new program from a previous option in an emerging discipline in an established school;
- a new program from an emerging discipline in an established school;
- a new program from an emerging discipline at a new school; or
- a new program from an established discipline in a new school.

The kind of guidance needed will depend on which of these development paths the program has followed. A CEAB Program Development Advisory Procedure, comprising two options, is available to provide advice to universities where new engineering programs are under development. A curriculum assessment option looks specifically at the curriculum content analysis and course information to provide feedback to the university. An informal visit option requires the university to contact a former CEAB member to do a "practice run" of an accreditation visit. The CEAB secretariat (support staff) provides the school with a list of former CEAB members whom it can contact to arrange the visit, and will supply the visitor with any documentation required. The evaluator submits the informal visit report only to the university for its guidance in developing the new program further. ◆