Reframing Higher Education

ACCREDITING ENGINEERING EDUCATION IN BANGLADESH

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Background

- Five Public Universities in Bangladesh have been offering degree programs in various branches of Engineering. The oldest (BUET) celebrated 60 years of engineering education in 2007. Graduates from any of the 5 major public technical universities can apply for Membership of Institution of Engineers Bangladesh (IEB).

- Since 1992, a large number of private universities have started offering undergraduate and masters degree programs in various branches of engineering (the current number of private universities is 54).

- With the increasing number of graduates coming out from these universities, the need has arisen for control of quality.

- IEB would enroll as Members only those who have degrees from programs accredited by BAETE.
Why Accreditation?

- Globalization has increased the tendency of engineering practice to be international in scope and has led to the need for credentialing of graduate engineers who want to practice in venues other than the one in which they were educated and initially licensed.

- Accreditation of engineering education programs forms basis upon which mutual recognition across national boarders – both for educational equivalency, and increasingly for practice mobility.

- Accreditation is an appropriate means of enhancing quality of engineering education in countries where major changes in education pattern are occurring, and in developing countries where improvement in quality of engineering graduates is seen as a major way of building an indigenous technological base upon which economic growth in the world marketplace can be achieved.
International Agreements: Engineers Mobility Forum (EMF)

- The purpose of EMF is to establish and maintain an International Register of Professional Engineers.

- The EMF agreement is a multi-national Agreement between engineering organizations in the member jurisdictions which creates the framework for establishment of an international standard of competence for professional engineering, and then empowers each member organization to establish a section of the International Register of Professional Engineers.
Objective of the EMF

• Facilitate international mobility of Professional Engineers
• Establish a de-centralized international Register of Professional Engineers.
• Promote best practice.
• Continue mutual monitoring.
• Understanding existing barriers to mobility and develop strategies to assist Government and licensing authorities to manage the barrier.
• Encourage Governments and licensing authorities to adopt the EMF Agreement.

EMF Full Members are: Australia (IEAust), Canada (CCPE), Hong Kong, China (HKIE), Ireland (IEI), Japan (JABEE), Korea(KPEA), Malaysia(IEM), New Zealand(IPENZ), South Africa (ECSA), United Kingdom (Ecuk), United States of America (USCIEP)

EMF Provisional Members are: Bangladesh (BPERB), India (IEI)
The Washington Accord signed in 1989, is an international agreement among bodies responsible for accrediting engineering degree programs.

- It recognizes the substantial equivalency of programs accredited by those bodies and recommends that graduates of programs accredited by any of the signatory bodies be recognized by the other bodies as having met the academic requirements for entry to the practice of engineering.
Board of Accreditation for Engineering & Technical Education (BAETE)

- BAETE has been established by the Institution of Engineers, Bangladesh, the sole professional body of graduate engineers in Bangladesh (around 20,000 members) for global recognition of engineering degrees.

- The Board is an autonomous body, independent of the Institution.

- The Board as a nongovernmental organization examines and accredits Engineering degree programs in Bangladesh.

- Board evaluate whether programs in engineering education conducted by institutions of higher education such as universities reach the levels expected by society and accredit those programs that reach such levels.

- Bangladesh Professional Engineers Registration Board (BPERB) requires that applicants for PEng status have an accredited degree (recognized by BAETE).
Composition of the Board

BAETE has 17 members in its Board

Chairman: Eminent Educationist (Engineer), nominated by Council of IEB

The members are drawn from

- Academics (Vice Chancellors, Professors)
- Eminent Engineers, both from the Private and Public Sectors
- Chairman, BPERB (ex-officio)
- Government Agencies (Ministry, University Grants Commission)
- Vice President (Academic) of IEB
- Two representatives from similar bodies in other countries

Member-Secretary: Eminent Educationist, Professors
Operation of the Board

- The President & Council of IEB will nominate the Chairman and the members of the first Board of Accreditation. Nominations to the subsequent Boards may be made by the President of IEB in consultation with the outgoing Chairman of the Board and other professionals/experts in the field.

- The Board will work independently within BAETE, and as far as possible will be financially self-supporting.

- Panel of Experts (Visiting Teams) subject-wise shall be drawn up for undertaking the evaluation of the programs.

- There shall be Sectorial Committees consisting of Chairmen and members who are experts in respective areas of concern. The Sectorial Committees will consider reports submitted by the visiting teams and forward it to the Board with their comments.
Objectives of Accreditation

- Accreditation is a process of external quality review
- Assure that graduates of an accredited program are adequately prepared
- Stimulate the improvement of the program
- Encourage new and innovative approaches to education and its assessment
- Identify accredited programs to the public
Accreditation Process

The salient features of accreditation process are:

- Self Study Report
- Peer Review
- Site Visit
- Action by Accrediting Organization (BAETE)
- Ongoing External Review
The Visiting Team

For each program to be accredited, the Board appoints a Visiting Team comprising a Chairman and two members. In addition Member-Secretary, BAETE, acts as an ex-officio member of the team for an initial period to be decided by the Board.

The Chairman of the Visiting Team is responsible for maintaining all necessary communications with the accrediting institution for evaluating the program and submitting the final report in consultation with his team members.

Members, Team Chair, persons associated with decision-making must not have any real or perceived conflicts of interest such as having a close, active association with a program or institution that is being considered for official action of BAETE.
ACCREDITATION PARAMETERS & THEIR WEIGHTAGES

1. Mission, goals are well defined and targeted to achieve the desired objective (100)

2. Financial & physical resources are available at Institution and program level and appropriately utilized. (100)

3. Human resources: faculty & staff are adequate in number and of quality required for the purpose. (300)

4. Human resources: Students have adequate background and quality to achieve the objective of the program. (300)

5. Teaching-learning processes is effective (450)

6. Supplementary processes (100)

7. Industry-institution interaction (70)

8. Research and development (30)

Total Marks: 1450
ACCREDITATION PARAMETERS & THEIR WEIGHTAGES

1. Mission, goals & organization (6.9%)
2. Financial, physical resources, util. (6.9%)
3. Human Resource: Faculty & Staff (20.7%)
4. Human Resource: Students (20.7%)
5. Teaching-learning process (31%)
6. Supplementary process (6.9%)
7. Industry-Institution interaction (4.8%)
8. Research & Development (2.1%)
Outcomes Assessment

Engineering Programs must demonstrate that their graduates have:

- An ability to apply knowledge of mathematics, science and engineering.
- An ability to design and conduct experiments, as well as to analyze and interpret data.
- An ability to design a system, component, or process to meet desired needs.
- An ability to function on multi-disciplinary teams.
- An ability to identify, formulate, and solve engineering problems.
- An understanding of professional and ethical responsibility.
- An ability to communicate effectively.
- The broad education necessary to understand the impact of engineering solutions in a global and societal context.
- A knowledge of contemporary issues.
- An ability to use the techniques, skills, and modern engineering tools for engineering practice.
ACCREDITATION POLICIES
for accreditation of a program

- Programs must be approved by UGC
- Must have graduated at least two batches of students.
- Must be a four year undergraduate degree program in engineering.
- All routes to completion of the program must satisfy appropriate criteria. (Fulfill Graduate Attributes)
- All programs shall include sound foundations in science and mathematics.
- For a multi-campus institution presents programs for accreditation, each campus will be considered as a separate institution in the evaluation process.
- The title of an accredited program must be properly descriptive of the content of the program and be shown on the graduating student's transcript and in the institution's literature.
ACCREDITATION POLICIES (Continued)

- Proliferation of program titles is discouraged because different titles for essentially the same programs are confusing or misleading to the public, including students, prospective students, and employers.

- All engineering programs must include the word "engineering" in the program title (with the exception of naval architecture programs).

- A program must meet the following requirements:
  - Should consist of a cohesive set of courses sequenced so that reasonable depth is obtained in the upper-level courses.
  - A definite stem should be obvious in the program in which adequate depth of knowledge is achieved.
  - Program should develop the ability to apply pertinent knowledge to the practice of the defined area of the program.
  - Must involve in broadening educational objectives.
• Broad programs that will prepare a student to take advantage of as many different career opportunities as possible are encouraged.

• Programs which omit instruction in a significant portion of a subject in which a professional in a particular field may reasonably be expected to have competence should not be accredited.

• Any program accredited by BAETE must offer primarily an engineering curriculum with or without some modifier in its title.

• Prime considerations in evaluating any engineering curriculum are that it should satisfies some accepted graduate attributes.

• If a program title is identified with one or more of the fields for which program criteria have been approved, that program must also meet the requirements of any relevant program criteria.
STEPS INVOLVED IN THE ACCREDITATION PROCESS

1. Submission (by the Institution) of the information and data according to the proforma provided by the BAETE.

2. Selection of Visiting Team and Chairman by BAETE.

3. Providing the Visiting Team with the information furnished in the proforma.

4. Critical study (by the Visiting Team) of the information furnished to the BAETE.

5. Furnishing additional information sought by the visiting team (through correspondence).

6. Visit to the Institution (Laboratory, Libraries, Workshops and other infrastructures) as per schedule.

7. Discussions with the Management, Principal, Deans, etc. enumerating the Programme's strengths and weaknesses.
8. Discussions among the members of the visiting Team for finalization of the report.

9. Submission of the report by the Chairman of the Visiting Team to the Sectoral Committee.

10. Consideration of the report of the Visiting Team by the Sectoral Committee and forwarding of the report with its observation to the BAETE.

11. Consideration of the Visiting Team report and the Sectorial Committee observations by BAETE.

12. Decision of the BAETE on the assignment of grade.

13. Reporting of the decision of BAETE to Council of IEB/UGC/DTE.

14. Issue of separate certificates assigning the appropriate grade to each Programme in the Institution.

15. Entry into the Directory (to be published annually) of the name of the Programme, the Accreditation grade and date of issue of certificate.
EVALUATION

**Self-Study Report** - An institution's educational programs will be initially evaluated on the basis of data submitted by the institution to BAETE in the form of a Self-Study Report.

**On-site Visit** - The Self-Study Report will be supplemented by an on-site visit by a carefully selected team representing BAETE and its Participating Bodies. The purpose of the on-site visit is three-fold:

- The intellectual atmosphere, the morale of the faculty and the students, the stability and continuity of the faculty and the students, the caliber of the staff and student body, and the outcome of the education offered as evidenced by the character of the work performed to be documented in a written statement.
- Institution will have provided the team with a random selection of graduates' transcripts from each of the programs under evaluation.
- The visiting team should help the institution assess its strong as well as its weak points.
OBSERVATIONS TO BE MADE BY THE VISITING TEAM

1. Auspices, control, and organization of the institution and of the college or division housing the program.

2. Educational programs offered and degrees conferred.

3. Maturity and stability of the institution and of the individual educational programs.

4. Basis of and requirements for admission of students \textit{and whether this is strictly followed}.

5. Number of students enrolled in both the institution and university as a whole and in the individual educational program - \textit{number of students at entry point and corresponding number at graduating (exit) point}.

6. Teaching staff and teaching loads- \textit{their quality and capability}.

7. Physical facilities - the educational plant devoted to the educational program.

8. Finances - investments, expenditures, and sources of income.
9. Curricular content.

10. Representative samples of student work that reveal the spectrum of educational outcome. In order to make a qualitative evaluation of a program, it is necessary that the institution exhibit:

- teaching materials such as course outlines and textbooks for all courses required for graduation.

- Sufficient examples of student work in technical, mathematics, and science courses must be available to the visiting team for the entire campus visit.

- Examples should show a range of grades for assignments, including homework, quizzes, examinations, drawings, laboratory reports, projects, and samples of computer usage in technical courses.

- Examples must also be presented to demonstrate compliance with the requirement for student competence in written and oral communications.
OBSERVATIONS TO BE MADE (Contd.)

11. Records of employment of graduates and, as appropriate, passage rates on nationally normed examinations to evaluate placement and performance in terms of the goals stated for each program.

12. Student support services appropriate to the educational and career needs of the students. These include registration; tutoring; career and academic advisement; library, computing, and laboratory resources; and additional services appropriate to the institution's and program's mission and educational objectives. Student services must be sufficient to support the program, and there must be evidence of their use.

13. Clearly stated expectations for learning and student achievement appropriate to the mission and educational objectives of the institution and program.
14. Academic policies relating to student, such as admissions, probation, dismissal, grievances, and graduation requirements must be fair, equitable, and published.

15. If academic policies for the program are different from or in addition to the institution's, those differences must be clearly stated.

16. The criteria used by faculty to evaluate student work must be equitable, consistently applied, and clearly articulated to students, faculty, and staff.
VISIT REPORT

The team's factual findings are presented orally to the institution's chief executive officer or designee and such faculty personnel as he or she wishes to assemble. The opportunity is presented at this time for the correction of factual errors in the team's observations.

The statement to the institution will generally include statements of the following types:

**Statements of fact** - example: This program has five full-time faculty members whose primary commitment is to the program

**Statements of compliance** - example: The curriculum satisfies the applicable criteria.

**Statements of concern** - A concern indicates that a program currently satisfies a criterion; however, the potential exists for the situation to change such that the criterion may not be satisfied.
VISIT REPORT (Continued)

**Statements of weakness** - A weakness indicates that a program lacks the strength of compliance with a criterion to ensure that the quality of the program will not be compromised. Therefore, remedial action is required to strengthen compliance with the criterion prior to the next evaluation.

**Statements of deficiency** - A deficiency indicates that a criterion is not satisfied. Therefore, the program is not in compliance with the criteria.

**Statements of observation** - An observation is a comment or suggestion which does not relate directly to the criteria being used for evaluation but is offered to assist the institution in its continuing efforts to improve its programs.

The visiting team reports its findings and recommendations in writing to the appropriate Sectoral Committee for editing and transmission to the BAETE (the Board).
Decision Making Process

- Report of the Visiting Team is placed before the Sectoral Committee (there is one Sectoral Committee for each major branch of Engineering).

- The Sectoral Committee reviews the decision and forwards it to the BAETE (Board).

- The BAETE finally approves the recommendation (and may send back to the Sectoral Committee for reconsideration).
Grading Of Degree Programs

- **‘A’: Excellent/ Very good**: meets all accreditation criteria or exceeds them;

- **‘B’: Good**: meets the minimum criteria and deficiencies are marginal and can be improved within a short time;

- **‘C’: Satisfactory**: deficiencies exists, but the Institution has the potential to make up in the near future, say 1 to 2 years;

- **‘NA’: Not Accredited**: not ripe for accreditation, in view of the seriousness of deficiencies.
PROVISION FOR WITHDRAWAL

Institutions have option to withdraw a program from accreditation process by written request to the Visiting Team Chairman, after being informed of the strengths and weaknesses, but before the Visiting Team holds formal discussions among its members for finalizing its report.

The purpose of above provision is to enable the Institutions to improve the program quality after making necessary investment and corrections to overcome the indicated weaknesses, rather than be assigned a lower grade or not being accredited at all.
Trends and issues in engineering education

Current trends in engineering education can be identified as follows:

- Reform in engineering education
- Outcomes assessment
- Utilization of advanced technologies in education
- Mobility of students
- Harmonization of higher education patterns
- Increased utilization of distance education
- Cross border agreements
- Technical capacity building in developing countries
- Increased payment for education by students
- Inclusion of sustainable development concepts
- Electronic conferences for faculty members
Trends in Engineering Accreditation
In response to declining interest in engineering study by both natives and international students, and to pressures from the Bologna Declaration and other sources to harmonize its engineering programs with those of other developed countries, universities in Germany are developing new engineering education systems in the bachelors plus masters pattern. At present these new programs are being offered in parallel with the traditional long programs leading to the Diplom-Ingenieur, and students are given the choice of which pattern to pursue. To assist in the development of these new programs, and to evaluate and certify their quality, a new Accreditation Agency for Programs in Engineering and Computer Science (ASII) has been established.
In the recent past, graduates of engineering programs in Japan were readily hired by its major corporations, given significant additional training by those corporations both initially and throughout their careers to enable them to contribute effectively to the economic goals of their employers, and then almost guaranteed lifetime employment and security by those employers. But the economic downturn in recent years has made job security a thing of the past, and globalization has made it imperative that Japanese engineering graduates be prepared for more self-directed career development, and that they be prepared for practice in the global marketplace. A new Japan Accreditation Board for Engineering Education (JABEE) has been established to provide quality assurance as new engineering programs are developed and implemented.
Jordan

In many developing countries, public university engineering programs do not have sufficient capacity to educate all those students who want to prepare themselves for employment in hot technological areas such as information technology. Private universities - often of questionable quality - typically spring up to meet the demand. In Jordan, the government has taken two steps to meet these challenges - the establishment of a new engineering program at a new public university, and the establishment of a stringent accreditation system for private universities. The Council on Higher Education has developed and implemented detailed prescriptive specifications for areas such as faculty/student ratios, laboratory equipment and space, libraries, and financial stability in order to assure that quality is provided in private universities offering degree programs within its borders.
Latin America

As engineering programs have developed in Latin American countries, several countries have moved toward the establishment of accreditation programs. Both ABET and the Canadian Engineering Accreditation Board (CEAB) have conducted workshops and training efforts in Latin America to assist in the development of engineering accreditation systems there. One major system recently developed is the Consejo de Acreditacion de la Ensenanza de la Ingenieria (CACEI) in Mexico, at least partially stimulated by the North American Free Trade Agreement. A new ‘Western Hemisphere Initiative’ has recently been announced by ABET, CEAB and CACEI – aimed at further assisting Latin American countries in the development of effective engineering accreditation systems, and furthering regional mutual recognition efforts.
United States of America

The Accreditation Board for Engineering and Technology (ABET) has been the major quality assurance mechanism for engineering education in the US since the 1930's. It is mature, and covers essentially all of the engineering, technology, computer science, and related programs in the country. It also has served as a model for engineering accreditation developments in other countries, and it has developed major international thrusts such as substantial equivalency reviews of engineering programs in foreign countries where it has been invited. In the past several years, ABET has made a major change in its evaluation criteria - moving from technique specifications to outcomes assessment. Its 'Criteria 2000' is based upon institutional self study and goal setting against which it will be evaluated, continuous improvement requirements for accredited programs, and detailed assessment of the outcomes of the engineering programs as the fundamental criterion for accreditation.
### What ABET’s Eight Criteria Cover

When an institution wants its program evaluated by ABET, for the first time or for reaccreditation, it completes a document called a Self Study, which asks for information in the following eight criteria. The Self Study may also require additional information that is specific to the program, but these eight categories form the core of the ABET accreditation system.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>Students</strong></td>
<td>Are they evaluated, advised, and monitored for success</td>
</tr>
<tr>
<td><strong>Program Educational Objectives</strong></td>
<td>What are the professional accomplishments graduates are expected to achieve five years after graduation</td>
</tr>
<tr>
<td><strong>Program Outcomes</strong></td>
<td>What are students expected to know and be able to do upon graduating</td>
</tr>
<tr>
<td><strong>Continuous Improvement</strong></td>
<td>How are institutions improving the quality of the academic program to aid the student</td>
</tr>
<tr>
<td><strong>Curriculum</strong></td>
<td>Is it appropriate and relevant to the program of study</td>
</tr>
<tr>
<td><strong>Faculty</strong></td>
<td>Are they sufficient in number and competent to cover all curricular areas</td>
</tr>
<tr>
<td><strong>Facilities</strong></td>
<td>Are the classrooms, laboratories, and equipment sufficient</td>
</tr>
<tr>
<td><strong>Support</strong></td>
<td>Does the institution support the program</td>
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Seoul Accord

The Seoul Accord is a multi-lateral mutual-recognition agreement among agencies responsible for accreditation or recognition of tertiary-level computing and IT-related qualifications.

Membership (a signatory) is voluntary, but the signatories are committed to development and recognition of good practice in Computing and IT-related education.

Signatories are:
ABEEK (Republic of Korea), ABET, Inc. (USA), ACS (Australia), BCS (UK), CIPS (Canada), HKIE (Hong Kong China), IEET (Chinese Taipei).
FEIAP
Federation of Engineering Institution of Asia and the Pacific

The Federation of Engineering Institutions of Southeast Asia and the Pacific (FEISEAP) is an international non-profit professional organization founded on 6 July 1978.

Being an independent umbrella organization for the engineering institutions in the Southeast Asia and the Pacific region, the objectives of FEISEAP were to encourage the application of technical progress to economic and social advancement throughout the world; to advance engineering as a profession in the interest of all people; and to foster peace throughout the world.

The Constitution unanimously adopted a resolution and changed its name to the Federation of Engineering Institutions of Asia and the Pacific (FEIAP).

IEB is a member of FIAP
Network of Accreditation Bodies for Engineering Education in Asia (NABEEA)
Establishment of Network of Accreditation Bodies for Engineering Education in Asia (NABEEA)

JABEE Symposium/Workshop (2006.12.15-16, Tokyo)

- A network among accreditation bodies in Asia was proposed and was approved.

(After Masataka Tanigaki, 2008)
The first meeting of NABEEA was held on August 8, 2007 at Penang, Malaysia for the take-off of the Network.

(After Masataka Tanigaki, 2008)
Participants

Bangladesh-BAITE (Board of Accreditation for Engineering and Technical Education, Bangladesh);
Chinese Taipei-IEET (Institute of Engineering Education Taiwan),
CTAEMC (Chinese Taipei APEC Engineer Monitoring Committee);
Japan-JABEE (Japan Accreditation Board for Engineering Education),
IPEJ (The Institution of Professional Engineers, Japan);
Korea-ABEEK (Accreditation Board for Engineering Education of Korea);
Malaysia-EAC (Engineering Accreditation Council, MALAYSIA),
IEM (The Institution of Engineers, Malaysia);
Philippines-PTC (Philippine Technological Council),
PATE (Philippine Association for Tchnological Education);
Singapore-IES (The Institution of Engineers, Singapore);
Thailand- Council of Engineers, Thailand

8 Jurisdictions, 12 Organizations, 24 Persons

(After Masataka Tanigaki, 2008)
Members of NABEEA  As of August 8, 2007

Full Member
Associate Member

Japan
JABEEX
IPEJ

Korea
ABEEK

Chinese Taipei
IEET
CTAEMC

Bangladesh
BAETE

Thailand
COE

Malaysia
EAC
IEM

Philippines
PTC
PATE

Singapore
IES

(After Masataka Tanigaki, 2008)
3. Goal, scope and activities of NABEEA

Levels of the cooperation and related tasks

Cooperation among Engineering Education Accreditation Bodies/Agencies in the region can be processed in the following four levels. NABEEA seeks the Level III as its immediate goal.

Level I: Preliminary level
Level II: Identification of similarities and dissimilarities
Level III: Harmonization of the accreditation system in the basic level
Level IV: Recognition of substantial equivalence of accreditation system

(After Masataka Tanigaki, 2008)
Conclusions

• For students seeking employment internationally or applying for graduate programs abroad, need to have a common base of educational background for their mobility

• The common base may be established by network or collaboration between regional accreditation bodies that look into regulatory requirements of higher education system

• Harmonization of the accreditation system in the basic level may be the immediate goal which may be extended to recognize substantial equivalence of accreditation system

• Higher education in South Asia may form its own accreditation network to harmonize regional education base for global mobility
Thank you