

A Model for Dual-Level Accreditation of Engineering Programs

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Abstract

The Engineering Accreditation Commission (EAC) of ABET does not currently allow dual-level accreditation. Engineering programs are either accredited at the basic level or the advanced level in specific disciplines at an institution.

The University of Louisville Speed School of Engineering currently has six Master of Engineering (MEng) degree programs accredited by EAC of ABET at the advanced level. In order to earn the accredited Master of Engineering degree in discipline, five calendar years of study are required, consisting of from 163 to 168 semester hours, including three semesters of required alternating cooperative internship assignments beginning in the sophomore year. These programs appear to be unique and have been in place since 1970. They conform to the models for engineering education for the future recently proposed by the NAE Engineering 2020 study, by the ASCE Body of Knowledge proposal, and by the recently approved changes to the Model Law by NCEES.

In addition to the accredited MEng programs, our students are awarded a B. S. in discipline after completing from 132 to 138 semester hours on the way to earning the respective MEng degree. These B. S. programs would be accreditable by EAC of ABET if it were permitted by EAC because they were purposely redesigned 1989 to comply with this policy which says, in part, " Criteria for advanced level programs are completion of a program of study satisfying the general criteria for basic level engineering programs. . ."

The six departments that administer the accredited Master of Engineering programs also offer the Master of Science and Ph.D. degrees in those disciplines. Thus, students who earn undergraduate degrees from programs at other Universities, or from selected non-engineering programs at U of L, may be accepted into these graduate programs in the

Speed School. Obviously, the M. S. and Ph.D. programs are not accredited by ABET, but rather conform to the accreditation criteria of the regional accreditation agency, the Southern Association of Colleges and Schools (SACS).

We contend that we have model programs that satisfy EAC of ABET criteria for accrediting engineering programs, and the only reason that we do not have both the baccalaureate and advanced level (MEng) programs accredited by the EAC is the dual-level prohibition imposed by ABET Policy II.B.8.a. This paper attempts to make a strong case for a change in this policy that will permit dual-level accreditation.

Introduction

The J. B. Speed School of Engineering was founded in 1925 with an endowment from the family of James Breckenridge Speed. It was established as a Scientific School to set it apart from engineering schools based in the mechanical arts and trades, as most were at that time. The charter of the school calls for it to teach science based engineering, and to incorporate mandatory cooperative internship for all of its students.

Four Speed School programs were accredited in 1936 when the Engineers Council for Professional Development (ECPD), the forerunner of ABET, was founded. These programs were Chemical Engineering, Civil Engineering, Electrical Engineering, and Mechanical Engineering.

The accredited programs in the Speed School have always required 5 calendar years of study to complete. Prior to 1970, students who completed these programs were awarded the Bachelor of Science degree in discipline. In 1970, about the time that the University of Louisville became a state school, our accredited programs were changed to conform to the “professional school model” promoted at the time as the future of engineering education.

Under this model, students earn a baccalaureate degree after four calendar years of study, and after completing one additional year of study, the students complete the Master of Engineering degree. At the next general review of these programs following these changes, the MEng programs were accredited by EAC of ABET at the advanced level.

There are currently six accredited MEng programs at the advanced level, the four originally accredited disciplines listed above plus the MEng in Industrial Engineering and in Computer Engineering and Computer Science.

In addition to the B. S. and MEng degrees, Speed School also offers the M.S. and Ph.D. degrees in the six disciplines, and B. S. and MEng degree programs in Bioengineering were initiated in Fall 2005.

The total enrollment in Speed School is approximately 2100 consisting of approximately 1500 undergraduates and 600 graduate students (including the fifth-year MEng program

students). Annually, Speed School places about 600 students in cooperative internship assignments.

Currently, Speed students earn a baccalaureate degree in discipline after four *calendar* years of study, including 3 alternating cooperative internships – *but the B. S. is not accredited!* The faculty of the School designed all of the undergraduate programs to meet EAC of ABET basic level accreditation criteria in the late 1980’s when it was last thought that ABET would allow dual-level accreditation in discipline. The baccalaureate degree programs remain accreditable at the basic level today because EAC Criterion 9 says, in part, "Criteria for advanced level programs are completion of a program of study satisfying the general criteria for basic level engineering programs. . ."[1]

The template for all Speed School accredited programs is shown below.

ACADEMIC PROGRAM TEMPLATE

DIVISION OF GENERAL ENGINEERING STUDIES		PROFESSIONAL SCHOOL OF ENGINEERING				
		DIVISION OF BASIC STUDIES		HIGHER STUDIES		
1 st YEAR		2 nd YEAR		BS-1	BS-2	G/P
Summer		Academic Studies	Academic Studies	CO-OP INTERN	Academic Studies	Academic Studies
Fall	Academic Studies	Academic Studies	CO-OP INTERN	Academic Studies	Academic Studies	Academic Studies
Spring	Academic Studies	CO-OP INTERN	Academic Studies	Academic Studies	Academic Studies	Academic Studies

← Accreditable Basic-Level Program →

← Accredited Advanced Level-Program →

EAC of ABET Accreditation Policies and Criteria

EAC Policy II.B.8.a. states, “Engineering programs may be accredited at either the basic or advanced level. The choices of level of accreditation (either basic or advanced), the degree awarded, and the length of the program are left to the institution. **A program may**

be accredited at only one level in a particular curriculum at a particular institution.”[2] [*Bold added for emphasis*]

However, the EAC of ABET General Criteria for Advanced Level Accreditation states that, “Criteria for advanced level programs are completion of a program of study **satisfying the general criteria for basic level engineering programs**, one academic year of study beyond the basic level, and an engineering project or research activity resulting in a report that demonstrates both mastery of the subject matter and a high level of communication skills.” [1] [*Bold added for emphasis*]

And, EAC Policy II.F.13 states that, “The functions of ABET are restricted by its Participating Bodies to the granting of accreditation and the publication of a list of those programs that are approved. It has no authority to impose any restriction or standardization upon educational programs, nor does it desire to do so. On the contrary, ABET aims to preserve the independence of action of individual institutions and, thereby, to promote the general advancement of engineering, technology, computing, and applied science education.” [2]

Thus, the EAC prohibition of dual-level accreditation in Policy II.B.8.a. appears to be in substantial conflict with both the criteria for advanced level accreditation and Policy II.F.13. regarding the functions of ABET. Interestingly, EAC and CAC (Computer Accreditation Commission) are the only commissions in ABET that have the prohibition against dual-level accreditation.

The main issues that Speed School has with the prohibition of dual-level accreditation can be summarized as follows:

1. All of our five-year, integrated Master of Engineering programs contain an ABET accreditable four-year component that meets the EAC of ABET general basic level criteria.
2. Students who complete the MEng programs have earned a total of 163 – 168 semester hours credit and a degree accredited by ABET at the advanced level.
3. From 40 to 50% of our students leave Speed School after 4 years and having earned from 133 to 138 semester hours, depending upon their major programs, with a baccalaureate degree not accredited by ABET!

National Issues

Many engineering schools in the U. S. are under pressure by university administrations to reduce the requirements for award of baccalaureate degrees to a range of from 120 to 128 semester hours. At the same time, universities are requiring increasing numbers of credit hours devoted to general education topics for all degrees awarded by those institutions. Employers are demanding that engineering graduates have more credits in non-technical, disciplinary topics such as written and oral communication skills, management, quality, accounting, international relations, etc. As a result, fewer technical courses are offered in engineering programs in order to satisfy the 120 to 128 semester hour constraint for award of baccalaureate degrees.

Contrary to this trend, the American Society of Civil Engineers (ASCE) is working diligently to gain acceptance of their concept of 5-year engineering degrees, curricula and experience that address a “Body of Knowledge” concept for civil engineering graduates, and enhanced qualifications for professional practice of civil engineering.

The summer 2005 “last word” page in ASEE Prism magazine had an article by Ernie Smerdon entitled, “Time for a Change: *ABET should lift its restriction against accrediting both undergraduate and master’s programs at the same school.*”

Phase II of the National Academy of Engineering (NAE) project, *Educating the Engineer of 2020: Adapting Engineering Education to the New Century*,” (2005)[3] has under its, “Recommendations – Re-engineering the engineering education system #2: ABET should allow accreditation of engineering programs of the same name at the baccalaureate and graduate levels in the same department to recognize that education through a ‘professional’ master’s degree produces an AME, an accredited ‘master’ engineer.”

The July 8, 2005 issue of the Chronicle of Higher Education [4], reporting on the NAE project said, “..... The report suggests, among other changes that: “Colleges and industry should view graduates with bachelor’s degrees as ‘engineers in training’ and should view a master’s as the engineering professional degree”

At its September 2006 national meeting [5], the National Council of Examiners for Engineering and Surveying (NCEES) voted to amend Section 130.10.C. 1. c. of its Model Law regarding Licensure by Examination to read, in part, “The following individuals shall be admitted to an 8-hour written examination in the principles and practices of engineering: (1) An engineer intern with a bachelor’s degree, with an additional 30 credits of acceptable upper-level undergraduate or graduate-level coursework from approved course providers . . .” The provisions of the amended Model Law will become effective on January 1, 2015.

Resistance to Change

As a result of pressures such as those cited in the previous section, ABET is currently accepting input regarding the advisability of permitting dual-level accreditation of engineering programs. The ASEE Engineering Deans Council (EDC) was urgently consulted during the 2005 ASEE National Meeting in Portland about its position on the issue. The result was the hasty adoption on June 14, 2005 of the statement to ABET that, “the Engineering Deans Council does not support removal of the ABET restriction of dual level accreditation until further study and dialogue can occur between the EAC of ABET and the Engineering Deans Council of ASEE.” The EDC based this recommendation upon the following four points:

1. Even though dual level accreditation would be voluntary as far as ABET is concerned, many states mandate that if programs offered at their institutions have the opportunity for accreditation, they must attain accreditation.
2. Just as universities now understand the market advantage of offering accredited programs over non-accredited programs, the same market forces would dictate accreditation at both the bachelors and the masters level, if available.
3. Discipline-specific accreditation at the masters level discourages and puts undesirable restrictions on interdisciplinary breadth so often pursued in many masters programs.
4. Masters level accreditation would potentially restrict the opportunity for admission of international graduate students and students with non-engineering undergraduate degrees.

The veracity of the first point was challenged, investigated and found by EDC to **not** be true. But, the EDC Executive Committee has recently reiterated the remaining three reasons as valid for their opposing the permission of dual-level accreditation of engineering programs by ABET.

Refutation of the ASEE EDC arguments

From the prior presentation of the facts in this paper regarding the engineering programs in the J. B. Speed School of Engineering, we are, obviously, very interested in seeing that ABET approves dual-level accreditation of engineering programs by the EAC. Accordingly, we offer the refutation of the remaining three justifications by the ASEE EDC opposing the issue:

2. Even though dual-level accreditation is possible for programs accredited by both the Applied Science and the Technology Accreditation Commissions of ABET, to our knowledge, not all of those programs have pursued, or been granted, dual-level accreditation.

We feel that the markets are forcing the issue of dual-level engineering accreditation now. And there are strong exogenous forces being exerted on ABET that are driving these market demands, e.g., those cited previously from ASCE, NAE, and NCEES, as well as the cry for better trained engineers by employers, international competition for engineering jobs, etc.

3. We have designed our programs at the University of Louisville so that there are certain required courses, followed by a variety of elective courses in the fifth years of our programs.

Since the implementation of ABET EC 2000, we are supposedly free to set the outcomes and objectives of these programs that best fit the needs of our students. Thus, we can, and do, introduce both depth and breadth, including the possibility of interdisciplinary breadth, in the thirty plus hours beyond the B.S. required to earn the Master of Engineering degrees in discipline.

4. For 36 years, we have shown the engineering educational community one model for how dual-level accreditation might be done, i.e., our five-year, integrated BS/MEng programs in discipline.

As noted earlier in this paper, in all of our disciplines we offer Master of Science and Ph.D. programs, not accredited by ABET, that easily accommodate international graduate students and/or students with non-engineering undergraduate degrees. Thus, this cohort of student population is not prohibited from entering our school and pursuing graduate study – in fact we would like to have more of them!

Conclusion and recommendation

There is a growing need for change in engineering education in the U. S. in order to ensure that our institutions produce graduates who add value to the organizations that employ them. We join the ASCE, NAE, NCEES, and others in promoting the institution of additional coursework beyond that required by current baccalaureate degree programs in order to practice engineering. Such a change will make engineering graduates more competitive in the “flat world” where corporations can outsource traditional engineering design for a fraction of the cost of domestic engineering salaries.

We propose that a way to begin this change is to insist that ABET permit dual-level accreditation of engineering programs. Specifically, we recommend that EAC of ABET Policy II.B.8.a. be changed to the following: “Engineering programs may be accredited at either the basic or advanced level, **or both**. The choices of level of accreditation (~~either basic or advanced~~), the degree(**s**) awarded, and the length of the program(**s**) are left to the institution. ~~A program may be accredited at only one level in a particular curriculum at a particular institution.~~” [Bold, underline and strikethroughs added to indicate the only changes in wording of this policy necessary to permit dual-level accreditation].

References

- [1] Criteria for Accrediting Engineering Programs, Effective for Evaluations During the 2006-2007 Accreditation Cycle, ABET, Inc., Baltimore, MD, 2006, pg. 4.
<http://www.abet.org/Linked%20Documents-UPDATE/Criteria%20and%20PP/E001%2006-07%20EAC%20Criteria%205-25-06-06.pdf>
- [2] Accreditation Policy and Procedure Manual, Effective for Evaluations During the 2006-2007 Accreditation Cycle, ABET, Inc., Baltimore, MD, 2006, pg. 4.
<http://www.abet.org/Linked%20Documents-UPDATE/Criteria%20and%20PP/A004%2006-07%20Accreditation%20Policy%20and%20Procedure%20Manual%201-4-06.pdf>

- [3] *Educating the Engineer of 2020: Adapting Engineering Education to the New Century,*” (2005), National Academy of Engineers, Washington, D.C.
<http://www.nae.edu/NAE/naepcms.nsf/weblinks/MKEZ-6EMRRE?OpenDocument>
- [4] Brainard, Jeffrey, Report by National Academy of Engineering Suggests Overhauling the Discipline, Chronicle of Higher Education, July 8, 2005.
<http://chronicle.com/weekly/v51/i44/44a01101.htm>
- [5] Minutes and Reference Material, NCEES 85th Annual Meeting, Anchorage, Alaska, September 13-16, 2006, National Council of Examiners for Engineering and Surveying, pg. 34. http://www.ncees.org/news/index.php?release_id=3