AC 2009-282: MULTIDISCIPLINARY ENGINEERING PROGRAMS AND ASEE'S ROLE AS THE LEAD SOCIETY FOR THEIR ABET ACCREDITATION

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Multidisciplinary Engineering Programs and ASEE'S Role as the Lead Society for Their ABET Accreditation

Abstract

From an individual ASEE member's initiative beginning back in fall 2000 and subsequent significant events, the ABET Board of Directors approved in June 2005 the proposal by the ASEE Board of Directors that ASEE be named the lead society for the accreditation review of "multidisciplinary" engineering programs. This new role is administered by the ASEE Accreditation Activities Committee under the authority of the ASEE Board of Directors. The accreditation assignment has been defined by ABET to mean those programs with names of Engineering, Engineering Physics, Engineering Science and General Engineering (plus a few minor variations).

Following a brief overview of the background history, this paper presents a current report of that development and features information about the numbers and trends of the accredited multidisciplinary engineering programs and the variety of institutions that host them. The paper includes extensive information in text and tables, as of the current 2008-09 cycle, about:

1) the ASEE organizational structure that has been developed to administer this new responsibility,
2) the experiences of the first three years of program evaluator visits,
3) the institutions with ABET EAC-accredited multidisciplinary engineering programs,
4) the number and names of the multidisciplinary engineering program(s) at each institution,
5) the ABET EAC accreditation history of these programs,
6) a look ahead at the projected future evaluator workload, and
7) other issues related to this new accreditation role and to recent changes in the process.

Introduction

One of the significant distinctions of a substantial number of baccalaureate engineering programs is that they intentionally do not align naturally with a currently so-called "traditional discipline" (such as civil engineering, electrical engineering, mechanical engineering, etc.). Such programs were previously called "non-traditional" engineering programs, or, more recently, "multidisciplinary" engineering programs. In the context of this paper, they include programs called engineering, general engineering, engineering science, engineering physics, and a few other similar (non-disciplinary) program titles. At this writing, there are 67 accredited engineering programs at 66 different institutions that are classified by ABET in this multidisciplinary category.

Extensive information about some of the typical characteristics of multidisciplinary engineering programs is available elsewhere.[1,2,3] For example, one study[2] suggested a classification of engineering (including general engineering) and engineering science programs that sought to identify and distinguish the institutional purposes for these programs as one of three purposes:

"philosophical," "flexible," or "instrumental." One thing these programs clearly were not was "disciplinary," as used here.

Multidisciplinary Engineering Programs

The data presented in this paper draws from the ABET website,[4] as accessed on March 11, 2009. That site maintains a list of accredited engineering programs under a set of drop-down menu titles, one of which is "Engineering, Engineering Physics & Engineering Science." That list currently comprises programs with one of those three titles, plus General Engineering and a small number of other titles that ABET has classified as program names that are judged not to be "disciplinary" names). The most recent roster assigned to ASEE for program accreditation under that heading includes 66 institutions offering 67 accredited multidisciplinary engineering programs. These numbers are likely to change annually as institutions may present new programs for accreditation upon graduation of their first students(s) or anytime thereafter, and, on the other side, any institution may not seek re-accreditation of a presently listed program or may in fact terminate the program.

In this multidisciplinary engineering program analysis, the following five groups of accredited multidisciplinary engineering programs are identified from the ABET website listing, as of the date accessed. Currently, there are 32 Engineering programs and 2 programs called General Engineering. There are 10 programs with the title Engineering Science or Engineering Sciences and 20 programs labeled Engineering Physics (including one labeled as Physics-Engineering Physics option). Three programs included in this ABET listing and grouped below as Other Multidisciplinary Engineering programs have the names of Engineering and Public Policy, Engineering–Course 2-A, and Integrated Engineering. In summary, the subsequent information in this paper relates to the following programs:

32	Engineering programs
2	General Engineering programs
10	Engineering Science(s) programs
20	Engineering Physics programs
3	Other Multidisciplinary Engineering programs
67	Multidisciplinary engineering programs

Since one institution has two different multidisciplinary engineering programs, there are 66 different institutions with these 67 currently accredited multidisciplinary engineering programs. And, subject to change by ABET, these 67 programs are currently under the purview of ASEE accreditation review responsibility. Others may also be assigned to ASEE at the time that program evaluator teams for specific campus visits are being formed.

Further information about the 66 institutions and 67 programs is provided by the Tables following this text. The data for those tables, which include only those institutions with one or more of the types of currently-accredited multidisciplinary engineering programs listed here, are from the ABET website[4] at the time of this writing. The alphabetical ordering of institutions used here is the same as that used by ABET. The official assignment of program accreditation roles is the responsibility of ABET, and may differ from the information presented here.

Because of the importance of the subject of program accreditation, the authors have taken special care to be both precise and correct, hereby apologize in the event of any errors, and welcome the corrections of any inaccurate or incomplete information.

Table 1 displays the year of first accreditation for the 67 currently accredited multidisciplinary engineering programs. This and the following Tables and statistics include only those institutions and programs that are accredited now. The current accreditation record began in 1936, the first year that national professional accreditation was offered. The list of currently accredited programs includes four institutions that were first accredited in that initial year. At that time, accreditation was under the Engineers Council for Professional Development (ECPD), the forerunner to the current ABET. The next 2 newly accredited multidisciplinary engineering programs were recognized in 1949 (13 years later). There are 2 more currently accredited programs that were first accredited in the decade of the 1950's, 6 in the 1960's, 6 in the 1970's, 11 in the 1980's, 15 in the 1990's, and 21 already in the 2000's.

Table 2 provides, alphabetically based on the form of the institution name used by ABET, a list of the accredited multidisciplinary engineering programs currently offered, showing:

the names of the institutions,
the accredited multidisciplinary engineering programs offered,
the years of their first accreditation,
the numbers of other accredited engineering programs offered, and
the years of the next general accreditation review.

In 34 of these 66 institutions, the multidisciplinary engineering programs are the only ABET-accredited engineering programs offered, while 24 of these 66 institutions offer 4 or more additional accredited engineering programs.

ASEE's Accreditation Role

A unique characteristic of these multidisciplinary engineering programs is that they do not have the additional "program criteria" for accreditation that most other "traditional" engineering programs do. Indeed, the novelty, variety, and interdisciplinary nature of these "multidisciplinary" programs would not easily accommodate the type of additional program criteria that the traditional programs have. That distinction was at the root of an ASEE member initiative that can be traced back at least to late 2001. It was believed by some involved with multidisciplinary engineering programs that there was a potential bias, possibly unintended or even subconscious, built into the accreditation of these programs through the program evaluation process. The majority of the program evaluators (PEVs) were likely themselves specialists through the doctoral level in a traditional disciplinary field. Many of them were teaching in a traditional disciplinary engineering educational program. Further, the PEV training provided to them by the disciplinary organizations (ASCE, IEEE, ASME, etc.) was also often led by doctoral specialists from that field and for which the disciplinary program had "program criteria." All program evaluators, including those for multidisciplinary engineering programs, came through that process. It was felt that this combination presented too strong a tendency to lead to a bias, even if consciously unintended, that every program should have a focus of disciplinary depth closely aligned to one of the recognized and well established fields of engineering. From that

perspective and in contemporary ABET accreditation terminology, this issue may not have been an accreditation process Deficiency, perhaps not even a Weakness, but it certainly was at least a strong Concern.

Several references describe the history[5,6] and process[7] through which ASEE has become involved with multidisciplinary engineering program accreditation for ABET. In a Prism article[8] while she was ASEE President, Sherra E. Kerns noted that "ASEE is a founding member society of ABET." Finally, in 2005, after several years of groundwork, from the initiative of ASEE members, the support of many other multidisciplinary engineering educators, and the cooperation of both ASEE and ABET leadership, ASEE had become the lead society for the accreditation of multidisciplinary engineering (and engineering technology) programs.

As a result of this new accreditation role and with leadership from Edwin C. Jones, Jr. and the support of many other ASEE leaders, ASEE adapted and strengthened its Accreditation Activities Committee (AAC) during 2005-06 to include this new role in its purview, in preparation for the 2006-07 accreditation cycle.[9] With ASEE's new role in the accreditation of multidisciplinary engineering programs, the schedule of the accreditation cycle and its accompanying need for program evaluators and related responsibilities became of immediate importance for the recruiting, training and assigning of that initial set of evaluators. The primary AAC meeting occurs at the ASEE Annual Conference each year. The current membership of AAC is listed on-line.[10] Information about applying to become an ASEE program evaluator for multidisciplinary engineering programs is given at the ASEE website.[11]

Accreditation of the Multidisciplinary Engineering Programs

The roster of accredited multidisciplinary engineering programs and the number of ASEE program evaluators needed changes each year and with each accreditation cycle, as illustrated by the data presented here in comparison with that of papers from the previous years of ASEE's new accreditation role.[12,13,14] Based on the current listing from the ABET website[4] as compiled in Table 2, Table 3 gives the number of institutions and the numbers of multidisciplinary engineering program accreditation visits implied for the six-year accreditation cycle from 2008-09 through 2013-14. Clearly, there is a wide variation reflected by those data in the anticipated workload from year to year, ranging from five programs at five institutions in 2008-09 to 20 programs at 20 institutions in 2011-12. In addition to the numbers of visits over that six-year cycle indicated in Table 3, Table 4 lists the specific institutions reflected in the data of Table 3.

The information available in March 2009 gives at least an initial indication of the anticipated ASEE program evaluator workload for fall 2009 assignments, but there are several other variables that impact significantly the actual number of visitors required for any specific year. This current information about future visits is quite preliminary, as it will likely change somewhat annually as new programs are developed and other programs may be terminated.

Further, there are several other unknowable factors that cannot be settled until the spring or early summer of the actual annual visit cycle. That is, there are several other factors that significantly influence the actual number of visits and the number of visitors needed that are not reflected in either of those two tables. For example, each visit requires the minimum of the team chair and

an evaluator for each program being reviewed but, in the case of a visit for an institution with a single program review, a minimum of two evaluators is required. In this case, the two evaluators share the assignment responsibility and combine their assessments into a single accreditation draft report. Even more elusive in determining the number of evaluators needed are those variables that cannot be identified numerically until ABET completes its visit assignments to each of the many PEV-sending organizations (ASME, ASCE, IEEE, ASEE, and many others) during the early summer before the fall visits begin.

These variables include new programs seeking initial accreditation, currently accredited programs that no longer seek accreditation, any of the several types of interim visits, and any other "innovations and special assignments" to ASEE as ABET seeks to fulfill their overall accreditation responsibilities. Therefore, the actual number of visitors needed each year remains uncertain until the roster of program accreditation assignments is finalized by ABET a few months preceding the accreditation visit schedule. In order to develop some indication of the likely variations of PEV workload from year to year, Figure 1 below tabulates ASEE's actual experiences for the initial three years of accreditation responsibility and illustrates the variability of each year's need.

Sources of ASEE PEV Assignments Needed	Fall 2006 Experience	Fall 2007 Experience	Fall 2008 Experience
Institutions with a program requiring an ASEE PEV listed for accreditation visits on ABET website	13	12	5
Institutions with multiple ASEE programs requiring another ASEE PEV	+1		
Institutions with a single accredited program (each requiring an additional ASEE PEV)	+2	+3	+4
Website number of ASEE PEVs	16	15	9
Institutions requesting an initial accreditation visit requiring an ASEE PEV	+3	+1	+2
Institutions requesting an initial accreditation visit with a single program (requiring second ASEE PEV)		+1	+1
Institutions not seeking a visit for an accredited program (that would have required an ASEE PEV)	-1	-2	
Institutions with a program having an interim visit requiring an ASEE PEV	+1	+3	+1
Institutions with a program having an interim visit requiring an additional ASEE PEV		+1	+1
Institutions not on the ABET website but added later by ABET (e.g., international institution)		+1	
ABET request for an ASEE PEV for a program not normally an ASEE PEV assignment		+1	
Final number of ASEE PEVs	19	21	14
Final number of programs for ASEE PEVs	17	16	8
Final number of institutions with ASEE PEVs	16	16	8

Figure 1. Components of ASEE PEV Historical Workload: First Three Years.

Preceding the actual ABET report of ASEE PEV visit assignment responsibility each year, only historical data from the first three rows (and summed in the fourth row) of Figure 1 are available from the ABET website. Nonetheless, the detailed three-year history given in Figure 1 provides some very useful historical perspective for ASEE planning for the number of ASEE PEVs that may be needed for future years. Additional detail is provided in the following tables:

TABLE 1. Year of First Accreditation of Multidisciplinary Engineering Programs
TABLE 2. Multidisciplinary and Other Engineering Programs
TABLE 3. Multidisciplinary Engineering Program Accreditation Schedule
TABLE 4. Date of Next General Review for Continuing Accreditation

This paper concludes with the Summary and References following these tables.

TABLE 1. Year of First Accreditation of Multidisciplinary Engineering Programs

Year of Accreditation	Engineering	General Engineering	Engineering Science	Engineering Physics	Other Multidisc. Engineering
1936	3	1	-	-	-
1949	-	-	-	2	-
1953	-	-	-	1	-
1959	-	-	1	-	-
1962	1	-	1	-	-
1965	-	-	1	1	-
1969	-	-	2	-	-
1971	1	-	1	1	-
1975	1	-	-	-	-
1977	1	-	-	1	-
1981	1	1	-	-	-
1983	1	-	-	-	-
1985	-	-	1	-	-
1986	-	-	-	1	-
1987	2	-	-	-	-
1988	1	-	-	1	-
1989	1	-	-	-	1
1990	2	-	-	-	-
1991	1	-	1	-	-
1993	-	-	-	1	-
1994	3	-	-	1	-
1995	1	-	1	-	-
1997	2	-	-	-	-
1998	-	-	-	1	-
1999	1	-	-	-	-
2000	3	-	-	-	-
2001	-	-	-	2	-
2002	-	-	-	-	1
2004	1	-	-	1	-
2005	1	-	1	-	1
2006	1	-	-	1	-
2007	2	-	-	2	-
2008	1	-	-	3	-
Total	**32**	**2**	**10**	**20**	**3**

TABLE 2. Multidisciplinary and Other Engineering Programs

College / University	Multidisciplinary Engineering Areas					Other Information		
	Engineering	General Engineering	Engineering Science(s)	Engineering Physics	Other Multidisc. Engineering	Year Program Accredited	Other ENGR Programs	Date of Next Review
Andrews University	√					2008	0	2013-14
Arkansas State University	√					1987	0	2010-11
Baylor University	√					1989	2	2012-13
Calvin College	√					1987	0	2013-14
Carnegie Mellon University					√	1989	5	2012-13
Case Western Reserve University				√		2007	10	2012-13
University of Central Oklahoma				√		2008	1	2013-14
The College of New Jersey			√			1995	3	2012-13
Colorado School of Mines	√			√		1983 | 1977	6	2012-13
Colorado State University			√			1969	6	2013-14
Dartmouth College	√					1936	0	2009-10
Dordt College	√					1991	0	2011-12
Embry-Riddle Aeronautical University - Daytona Beach				√		1993	5	2013-14
Fort Lewis College				√		2004	0	2009-10
Geneva College	√					1995	0	2012-13
George Fox University	√					2005	0	2010-11
Grand Valley State University	√					1990	3	2010-11
Harvard University			√			1962	0	2009-10
Harvey Mudd College	√					1962	0	2009-10
Hofstra University			√			1971	2	2011-12
Hope College	√					2000	0	2011-12
University of Illinois at Urbana-Champaign		√				1936	11	2013-14

TABLE 2 (Continued). Multidisciplinary and Other Engineering Programs

College / University	Multidisciplinary Engineering Areas					Other Information		
	Engineering	General Engineering	Engineering Science(s)	Engineering Physics	Other Multidisc. Engineering	Year Program Accredited	Other ENGR Programs	Date of Next Review
ITESM, Monterrey Campus				√		2008	8	2013-14
John Brown University	√					1997	0	2008-09
The University of Kansas				√		1949	8	2012-13
LeTourneau University	√					1988	0	2008-09
Loyola College in Maryland			√			1991	0	2011-12
University of Maine				√		1949	7	2012-13
Massachusetts Institute of Technology					√	2002	13	2013-14
McNeese State University	√					1981	0	2009-10
Mercer University	√					1990	0	2013-14
Messiah College	√					1994	0	2011-12
Michigan Technological University	√					1975	9	2010-11
Montana Tech of the University of Montana		√				1981	8	2010-11
Murray State University				√		1998	0	2009-10
New Mexico State University				√		2007	6	2012-13
City University of New York, College of Staten Island			√			1985	0	2008-09
The University of Oklahoma				√		1953	10	2011-12
Franklin W. Olin College of Engineering	√					2007	2	2012-13
Olivet Nazarene University	√					2000	0	2011-12
Oral Roberts University	√					1994	0	2011-12
University of the Pacific				√		1986	5	2012-13
Pennsylvania State University			√			1959	17	2008-09
University of Pittsburgh				√		1994	8	2011-12
Robert Morris University	√					2004	1	2009-10

TABLE 2 (Continued). Multidisciplinary and Other Engineering Programs

	Multidisciplinary Engineering Areas					Other Information		
College / University	Engineering	General Engineering	Engineering Science(s)	Engineering Physics	Other Multidisc. Engineering	Year Program Accredited	Other ENGR Programs	Date of Next Review
Roger Williams University	√					2000	0	2011-12
Smith College			√			2005	0	2010-11
Southeast Missouri State University				√		2001	0	2012-13
University of Southern Indiana	√					2007	0	2012-13
Southern Utah University					√	2005	0	2010-11
Stevens Institute of Technology	√					1936	7	2009-10
Stony Brook University			√			1965	5	2011-12
Swarthmore College	√					1936	0	2010-11
Tarleton State University				√		2006	0	2011-12
Taylor University				√		2008	1	2013-14
University of Tennessee at Chattanooga	√					1977	6	2009-10
University of Tennessee at Martin	√					1999	0	2010-11
Texas Christian University	√					1997	0	2008-09
Texas Tech University				√		1965	8	2011-12
Trinity College	√					1994	0	2011-12
Trinity University			√			1969	0	2011-12
The University of Tulsa				√		1971	4	2012-13
Union University	√					2006	0	2011-12
Walla Walla University	√					1971	0	2013-14
University of Wisconsin-Platteville				√		2001	6	2012-13
Wright State University				√		1988	6	2011-12
Total Schools with Program	**32**	**2**	**10**	**20**	**3**			

TABLE 3. Multidisciplinary Engineering Program Accreditation Schedule (ABET Website)

Date of Next Review	Number of Universities	Engineering	General Engineering	Engineering Science	Engineering Physics	Other Multidisc. Eng.
2008-09	5	3	0	2	0	0
2009-10	9	6	0	1	2	0
2010-11	9	6	1	1	0	1
2011-12	17	8	0	4	5	0
2012-13	15	5	0	1	9	1
2013-14	11	4	1	1	4	1
Total	**66**	**32**	**2**	**10**	**20**	**3**

TABLE 4. Dates of Next General Review for Continuing Accreditation

Date of Next Review: 2008-09

1. John Brown University
2. City University of New York, College of State Island
3. LeTourneau University
4. Pennsylvania State University (University Park, PA)
5. Texas Christian University

Date of Next Review: 2009-10

1. Dartmouth College
2. Fort Lewis College
3. Harvard University
4. Harvey Mudd College
5. McNeese State University
6. Murray State University
7. Robert Morris University
8. Stevens Institute of Technology
9. University of Tennessee at Chattanooga

Date of Next Review: 2010-11

1. Arkansas State University
2. George Fox University
3. Grand Valley State University
4. Michigan Technological University
5. Montana Tech of the University of Montana
6. Smith College
7. Southern Utah University
8. Swarthmore College
9. University of Tennessee at Martin

Date of Next Review: 2011-12

1. Dordt College
2. Hofstra University
3. Hope College
4. Loyola College in Maryland
5. Messiah College
6. Olivet Nazarene University
7. Oral Roberts University
8. Roger Williams University
9. Stony Brook University
10. Tarleton State University
11. Texas Tech University
12. The University of Oklahoma (2)
13. Trinity College
14. Trinity University
15. Union University
16. University of Pittsburgh
17. Wright State University

Date of Next Review: 2012-13

1. Baylor University
2. Carnegie Mellon University
3. Case Western Reserve University (2)
4. Colorado School of Mines (2)
5. Geneva College
6. The University of Kansas
7. University of Maine
8. The College of New Jersey
9. New Mexico State University
10. Franklin W. Olin College of Engineering
11. University of the Pacific
12. Southeast Missouri State University
13. University of Southern Indiana
14. The University of Tulsa
15. University of Wisconsin-Platteville

Date of Next Review: 2013-14

1. Andrews University
2. Calvin College
3. University of Central Oklahoma
4. Colorado State University
5. Embry-Riddle Aeronautical University – Daytona Beach
6. University of Illinois at Urbana-Champaign
7. ITESM, Monterrey Campus
8. Massachusetts Institute of Technology (2)
9. Mercer University

Date of Next Review: 2013-14 (continued)

10. Taylor University
11. Walla Walla College

Summary

The background and additional responsibilities related to a significant new ASEE initiative have been reviewed, together with a focus on the institutions and their multidisciplinary engineering programs for which ASEE is now the lead society in the ABET engineering accreditation process. Further, based on the first three years of experience, the process of estimating the number of ASEE's program evaluators required for ABET accreditation visits has been reviewed and illustrated for those first three years of ASEE experience. Together with the data from Tables 2-4, one of the important conclusions to be drawn from this summary of ASEE's first three years and from the variability (as known today) of the future schedule is that the cadre of trained evaluators needs to be kept well in excess of the number that could be quantified from this analysis.

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