

Weber State University-Electronics Engineering Technology  
Response to Board of Regents Five-Year Program Review

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Name of Responder(s): Christian W. Hearn, Ph.D  
Assistant Professor – Engineering Technology  
1447 Edvalson Street Dept. 1802  
Ogden, UT  
[christianhearn@weber.edu](mailto:christianhearn@weber.edu) phone: 801-626-6371

The primary purpose of the program review at WSU is to improve academic programs. An academic program may consist of an entire department which houses several majors, or an academic program may be a component of a department.

Program reviews are not conducted to expressly identify individual programs for discontinuance. Reviews will result in an identification of program strengths, weaknesses, and recommendations for change. The program faculty, responsible academic dean, and provost will respond in writing to these recommendations as part of a program-improvement plan.

**Background:**

The Electronics Engineering Technology (EET) program was first accredited by the TAC of ABET in 1978 and has been continually accredited since that time. Incremental changes to the EET program were made until 2012.

In 2012, CEET faculty and resources were divided to create a separate Electronics Engineering (EE) program. The remaining CET program was replaced with an EET program. The EET program was reorganized, with approximately half the existing laboratory facilities, one full-time faculty and four instructors (three adjunct and one part-time). EET then merged with the existing Mechanical, Manufacturing, and Design programs (MET, MFET, DET) to create the Department of Engineering Technology. To date, the part-time faculty has retired, two tenure-track faculty members have been hired (in 2012, and 2013) and three adjuncts support the program.

In June 2014, Weber State University demolished Building Four which housed laboratories and facilities for both the EET and EE programs. All existing laboratory facilities and both the EET program and the EE Department were displaced for approximately two and a half years. Through a collaborative effort led by the Dean and the Department Chair, the Engineering Technology department has adapted and modified existing space within the ET Building to create several electronic and computing laboratories.

**ABET Review of CEET Program (2009):**

The CEET program/department passed the previous ABET Review in the fall of 2009. One program concern from the final report is shown.

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Program Concern: **Ref:** ABET Final Visitation Statement on WSU – October 18-20, 2009

Criterion 4 states, *'the results of these evaluations of program educational objectives and program outcomes must be used to effect continuous improvement of the program through a documented plan.'*

Although a significant amount of evidence was provided to indicate data has been collected and analyzed for continuous improvement, it is not clear what benchmarks of performance are being used to signal a need to improve the program. In the absence of a baseline metric for determining adequate progress, it will be difficult to systematically and consistently determine when a change to the program is required. Therefore, this finding remains a concern until the program demonstrates results from evaluations of program educational objectives and program outcomes are being used to effect continuous improvement of the program through a documented plan.

**Summary from the BoR Program Review.**

One major strength is the program is offering viable AAS and BS degree paths that support industry, and has for many years. The EET program provides a 'hands-on' engineering program combined with options to earn AAS and BSEET degrees. The department faculty members appear to be of appropriate background and education to support the mission statement of the program.

A major weakness that should be addressed is the accreditation issues with ABET, and the status of college-wide outcomes (faculty-loads are related). In addition, there appears to be a need to determine the working relationship with the EET and EE programs, and to resolve any internal issues to further support and strengthen the two areas.

The following quality ratings were suggested to record program data and information during the review.

- S Strength: especially effective practice or condition
- A Adequate: meets expected standards
- C Concern: action could be needed in the future
- W Weakness: action needed
- X Did not evaluate – indicate why area was not evaluated

Element	Comments
The program must show how it has implemented any recommendations from the previous review and what effect these changes had on the program. If any recommendations were not implemented, the program should explain why they were not put into place	It is not clear from the self-study what recommendations were made in the previous WSU program review. We have stated the program has moved backwards in terms of the recommendation from the 2009 ABET review. Since all the disruptions, there is motion in the right direction, but there are significant blocks to accomplishing those tasks quickly.

**Table 1.** Weakness element and comment

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Element	Comments
The program mission statement must be appropriate to and support the mission statements of both the college housing the program and the university	It seems there is a significant amount of doubt amongst the faculty about program direction. This can be seen in their discussion about potential interaction with non-Weber programs, the Electronics Engineering program, and issues with facilities and funding.
The curriculum should be consistent with the program mission	Friction exists between the BS-EET program and some of the required support courses. (MATH, PHYS)
Courses to support the major/minor/general ed/service programs are offered on a regular basis to ensure students are able to complete grad reqs in a timely manner.	There have been some comments made regarding successful degree completion. Perhaps a step path-way to the AAS-EET first should be considered.
Learning outcomes must support the goals of the program and the constituencies served	Many of the learning outcomes do not have defined measures and metrics. Additionally, many of the outcomes do not have a course or series of courses where the concepts are introduced. A related issue was brought up in 2009 during the previous ABET accreditation and has not significantly improved.
Learning outcomes should be directly linked to the program's curriculum. An explicit curriculum grid illustrating this alignment, as well as the depth to which each course addresses each outcome is publicly available	There appears to be evidence the department has not fully established and addressed issues with outcome assessments, internally and externally (ABET)
The program has a developed set of measures for assessment that are clearly defined and appropriately applied	ibid
Each learning outcome is assessed with at least one direct measure of learning; thresholds for acceptable performance are defined and published	ibid
Demonstrate that evidence of learning is being gathered on a regular basis across the program. Demonstrate the evidence is aggregated, and reported in the aggregate	ibid
Demonstrate these measures are being used in a systematic manner on a regular basis and are reviewed against department-established thresholds, i.e. are the program faculty meeting regularly to discuss the evidence?	ibid
Demonstrate the assessment of the program mission and student outcomes are being used to improve and further develop the program, Is it clear what drives the program?	ibid

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The program maintains a core of full-time faculty sufficient to provide stability and ongoing quality improvement for the degree program	EET faculty members have enormously high teaching loads. It was not clear there is appropriate compensation for the significant amount of overload carried. This seems to be amplified by the cross-over between the EE and EET programs. There are severe concerns about having enough time to accomplish the additional academic requirements for tenure and promotion in light of heavy teaching loads without 'moonlighting'
Processes are in place to determine appropriate teaching assignments and service workloads, to guide and mentor contract/adjunct faculty, and to provide adequate support for activities which implement the programs mission	There is a need to add more full-time faculty members to this program. Particularly, there is a need for a faculty member with expertise in power and motors. (EET 2120)
The facilities, equipment, and library support needs are adequate to meet the mission and the goals of the program	Adequate facilities are a concern. It was noted there are lab locations where having the number of students in class, with the associated equipment and activities could present a safety hazard.  There computers that are not able to meet the needs for laboratory activities. This may be due to a combination of equipment age and university IT requirements.  Additionally, there are shared facilities between the EET and EE programs. Despite the shared nature of some labs, there does not appear to be evidence of shared governance, particularly with respect to maintenance costs
If the program has external advisory committee, it should meet regularly and minutes of the meetings should be made available	The IAC only meets annually and there is a question whether anything productive comes from it. Faculty expressed a desire to have more productive relationships on a more frequent basis with industry partners.

**Table 2.** Tabulated Concerns – Elements and Comments.

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**Response:**

The EET program and the Engineering Technology department are satisfied with the perceptive conclusions identified by the BoR Review Team. Concerns with corresponding comments and suggestions shown in Table 2 can be roughly categorized into two broader categories: program direction, and education metrics. An explanation of the concerns and weaknesses identified by the BoR Review Team will follow. However, it is worth noting the difficult administrative and physical changes that have occurred in the past three years. For example, the BoR self-study Executive summary mentioned the tumultuous nature of the EE/EET split and reorganization, followed by the loss of Building Four facilities. One full-time faculty member in the original CEET department became the program director; two new tenure-track faculty members have been hired.

Engineering Technology within the College of Applied Science and Technology is an industry- or market-driven entity in a university setting. The affiliations and partnerships with local industries that hire AAS and BS graduates set the needle for where Engineering Technology sits between state ATCs and upper-tier universities (UofU and USU) in the state education spectrum.

WSU Engineering Technology programs, other than EET, do not have Engineering counterparts. Their programs are established and time-tested with generally satisfied industrial affiliates. The EET program with the separate EE track, is still in a transient state following a significant disruption. To date, EET student enrollments (down), program budgets, curriculum standards, and program leadership and mission statements, are all in a state of flux.

Program direction is determined primarily by the Industrial Advisory Committee (IAC). The EET program will press to interact with the IAC on a more frequent basis to understand what can be done to make our AAS and BS graduates better professionals in the local economy. The program hopes to initiate a method to promote short, one-on-one meetings with employers on their terms.

Educational metrics are comprised primarily of ABET course assessment criteria and internal tests or checkpoints for student progress. Three program metrics will be described.

- EET Program Exam – sophomore and senior
- Professional Development – EET 3090, EET 4890
- SME-EET Certification Exam

EET Program Exam

The EET Program exam was recently created as an assessment tool to track and evaluate student attainment of ABET Student Learning Outcomes. Questions were developed by the faculty in the general areas of circuit analysis, digital systems, and fundamental electronics. Fifty questions were formatted to create an on-line exam using Weber State University's Chi-Tester program. A copy of the EET Program Exam is available upon request.

Sophomore and senior-level students will be required to take the exam at the on-campus testing center. A direct comparison of a student's performance on an exam taken as a rising junior to his/her performance as a graduating senior will establish a baseline metric for determining adequate progress. A vital outcome of this exam will be an internal mechanism to systematically determine the need for improvements to the program.

The exam was completed in the fall of 2014 and the first round of sophomore and senior-level testing was completed during the spring semester of 2015. Table 3 lists the last four digits of the student's ID number, his/her academic level, and the percent of problems that were correct.

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Sophomore		Senior-Level	
W-number (last 4)	Score Percent	W-number (last 4)	Score Percent
1323	79.6	8750	46.9
9853	61.2	1337	67.4
4114	81.6	3239	53.1
6512	63.3	1934	44.9
9495	71.4	1844	67.4
3049	63.3	3450	63.3
2698	69.4	2481	61.2
5844	57.1	7197	77.6
		5337	81.6
		3851	51.0
		4620	85.7
		7080	51.0
$\bar{x}_{SOPHOMORE}$	68.4	$\bar{x}_{SENIOR}$	62.6

**Table 3** EET Fundamentals Exam Results for first iteration (Spring 2015).

The preliminary results from the first exam reveal a noticeable and surprising decrease in averaged performance levels from the sophomore level to the senior level students. Several factors may have contributed to the discrepancy and additional data-sets will be required to confirm a trend. However, following discussions with the faculty and given due consideration of the non-traditional nature of the WSU engineering technology students, a technical curriculum gap between the sophomore and senior levels is believed to be a significant factor in the contradictory nature of the results shown in Table 3. Further use of the exam will also help to determine how the exam itself needs to be changed to make it more effective. To date, it appears that the EET Fundamentals Exam is an effective assessment tool and can help to identify necessary changes to the program.

A Dacum process is planned for summer 2015 to examine the restructuring of the junior and senior level sequence of courses to focus the majority of substantive technical courses in years two and three of the program. It is proposed that the suggested course sequence to complete the requirements for a Bachelor's degree be revised and the junior and senior level course sequence be restructured. It is planned to put the non-technical Gen Ed requirements at the very end of the program and allow student's technological skillset to be better applied to their senior projects.

#### Professional Development

A second assessment method uses information from selected courses described below. The Project Management course, EET 3090, was created to provide the necessary background for the capstone project courses. This course offers faculty the opportunity to assess our students in the areas of professional development, ethical responsibilities, and diversity through discussion, testing, and assignments. Further, in the past there was a program deficiency in the evaluation process for assessing student ability to communicate effectively through written, oral, and graphical forms.

A rubric was established for the EET 4010 and EET 4020 senior project presentations that clearly identifies expectations in those areas and establishes a method of quantifying specific learning objectives. It is also planned to use the same elements of this rubric in other EET courses that evaluate presentation skills. To assist our students with the development of their communication and teamwork

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skills, EET 2130, EET 2170, and EET 3040 have integrated term projects that include formal presentations.

A third assessment method uses results from surveys that were implemented in the EET 4890 COOP Work Experience course this past year to assess whether students have a commitment to quality, timeliness and continuous improvement. Information obtained from both the students and the employers over the course of the semester is used to evaluate student progress.

### SME-EET Certification Exam

The WSU MFET program has successfully been using the SME manufacturing certification exam as an assessment tool for several years. The SME EET certification exam is relatively new and is now available for EET outcome assessment. A screen-capture of the website describing this exam is shown in 1. The Dean has approved funding for a group of EET seniors to sit for the SME EET exam in the summer 2015. Results will be available for review by the ABET Review Team in the fall of 2015. It is anticipated that funding to cover the cost of the exam will be made available via course fees to allow all seniors to take the exam in the future.



**Fig. 1.** SME-EET exam for assessment.

### **Conclusion:**

The overall EET long-term strategy will strive to maintain technical standards commensurate with nationally-ranked EET programs (e.g. Purdue, RIT), while fulfilling an important role in state university education. WSU-Engineering Technology is a pathway for Utah residents to complete technical B.S. degrees part-time. ET faculty recognize a Weber ET student who is called 'non-traditional' in the academic lexicon, is a 'traditional' student in our classrooms and laboratories. The student is typically more mature (older) and balancing the demands employment and parenthood, with program requirements. It is the responsibility of the department to adjust and optimize ET programs to facilitate degree completion at the two-year and four-year levels. .

The EET department is grateful for the Regents review process and the opportunity to adjust, and even restructure the program. Faculty members recognize the process will improve the program and improve the probability of professional success for future graduates.