

EXPERIENCES IN PREPARING MULTIPLE PROGRAMS FOR A JOINT ABET ACCREDITATION GENERAL REVIEW

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Abstract — The United States Military Academy (USMA) will have seven of its programs undergo a joint review by the Engineering Accreditation Commission (EAC) and the Computing Accreditation Commission (CAC) of the Accreditation Board for Engineering and Technology (ABET). Evaluating all seven programs simultaneously allows synergy, but it necessitates coordination at the institutional level, and requires the support and cooperation of non-reviewed programs. The Department of Electrical Engineering and Computer Science will have both programs reviewed, by the EAC and CAC, respectively. There are many similarities and differences between the two, requiring internal controls, timelines, and processes to ensure correct completion of the requirements. Course directors and other faculty need guidance in preparing for the visit, managing additional administrative loads during the record year, and in understanding how assessment improves their programs. Although all of the areas mentioned above are discussed in the context of the USMA, they should prove useful to any institution preparing for an ABET visit.

Index Terms — Accreditation Preparation, Multiple-Program

BACKGROUND

The Accreditation Board for Engineering and Technology (ABET) accredits engineering, technology and applied science programs. Part of their mission is to promote quality and innovation in, and to consult and assist in the development and advancement of, engineering education. [1] Engineering programs that wish to demonstrate that they meet defined standards and criteria for success in engineering education voluntarily undergo an ABET accreditation general review. General reviews are conducted once every six years, and include preparation of a self-study and a visit by an ABET evaluation team. The academic year immediately preceding the review is called the record year because the institution captures data and prepares documentation demonstrating accomplishment of the ABET criteria and standards.

The United States Military Academy at West Point, New York, is a medium-size academic institution with 4000

students (cadets). There are seven accredited engineering programs: Computer Science, Electrical Engineering, Civil Engineering, Mechanical Engineering, Systems Engineering and Environmental Engineering. All seven programs request accreditation visits by ABET on the same six-year cycle, which helps consolidate the institutional effort. The Computing Accreditation Commission (CAC) reviews the CS Program, and the Engineering Accreditation Commission (EAC) reviews the other six programs. There is some synergy in undergoing a joint review, but this necessitates coordination at the institutional level and cooperation between programs, including the non-engineering programs that are not seeking ABET accreditation.

INSTITUTIONAL LEVEL

At the institutional level, the focus of the USMA has been on melding a decade-old curricular assessment and continuous improvement effort with emerging EC2000 processes and philosophies. The USMA embraced assessment curriculum-wide as “the right thing to do” during its self-study in preparation for Middle States Accreditation starting in 1992. Results from the new assessment process had already been incorporated in the initial publication of the USMA academic strategic plan known as Educating Army Leaders for the Twenty-First Century (EAL21).

EAL21 is a living document produced by a network of faculty “goal teams” charged by the Dean of Academics to do the staff work. As such, EAL21 is the evolving product of an extensive, continuous effort to glean from the USMA’s primary constituency—the U.S. Army and Department of Defense—what is expected and needed of graduates. EAL21 began its second cycle of revision from constituency input at the same time EC2000 emerged within ABET. USMA’s ABET programs were therefore already thinking about accreditation in terms of USMA’s assessment system.

The new criteria changed many of the details, but not the essential idea that the Army is the customer of USMA ABET programs. The Army’s input, both direct and refined through the EAL21 preparation process, was already the foundation of engineering and computer science curricular evolution at West Point.

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In this context, the main work of implementing EC2000 at the institutional level was logistical and administrative. The following tasks were established:

- Identify aspects of the USMA assessment process that could be used as-is or modified to satisfy EC2000 process needs.
- Formulate a plan to meet remaining institutional EC2000 process needs.
- Educate the ABET program faculties on EC2000 and its relationship to the USMA assessment process.
- Develop a framework for sustaining the above in the long term.

Existing units of the USMA governance structure that could handle this work included the staff of the Dean of the Academic Board and the standing Math, Science and Engineering (MSE) Committee, composed of the heads of departments of the associated disciplines and led by the senior member. The USMA has no Dean of Engineering. To some extent, the MSE committee and its chairman perform the functions of the Dean of Engineering and associated staff. However, none of these bodies was well suited for the detailed staff work required to implement EC2000.

Standing ABET Committee

The Dean elected to appoint a separate committee of representatives of each ABET program, departments offering courses in ABET programs, Dean's staff and library, and institutional research. The committee role was executive in nature, with the following functions:

- Implement EC2000 within the framework of the exiting USMA assessment process, as described above, by establishing Academy-wide processes and standards where appropriate.
- Manage administrative matters related to the EC2000 assessment loops, including:
 - Surveys of graduates and Army leaders supported by Academy and Dean level institutional researchers.
 - Funding and administration for program boards of advisors.
- Streamline administrative preparations for evaluation visits. These include:
 - Preparing the institutional request for evaluation.
 - Briefing and gaining support of senior Academy leaders.
 - Coordinating preparation of Appendix II of program self-studies.
 - Coordinating documentation standards, especially for courses in non-ABET departments offering supporting courses.
 - Procuring and preparing the thousands of necessary documentation notebook shells.
 - Preparing the detailed plan for the evaluation visit.

The job of communicating with the ABET evaluation team on behalf of the Academy was placed with the chairman of the MSE committee. The committee has approximately one meeting per month.

The Military Academy in general, and the Department of EE&CS specifically, benefits from its military nature in that it does not require additional effort to gain "faculty buy-in" to the assessment process or the ABET visit preparation. The time for expression of ideas and political interactions is when the plans and policies are thoroughly staffed by the appropriate committees. Once the Dean or Department Heads make a decision the faculty executes the necessary policies and procedures.

Cross-Program Reviews

A particularly useful mechanism was the EAC program reviews conducted within the institution and an external CAC program review of the Computer Science program. There are several advantages to doing an evaluation of another program. First, a role-playing evaluator gets the perspective of what an incoming evaluator will be doing in preparation for the visit. An evaluator will form an impression of the program based on the self-study, public materials, institutional profile, and transcripts. Second, problem areas can be identified and corrected early. Third, a role-playing evaluator can observe how another program does assessment, documentation, and training. Good ideas can be shared and adopted in a relaxed atmosphere.

To start the process, the ABET Committee ordered transcripts of the two previous graduating classes and distributed them to the program directors. Each program was tasked to evaluate two other programs by role-playing an ABET evaluator. A review consists of an examination of the self-study, all printed and electronic public materials, transcripts, and interviews.

The transcript is the key document in the verification of program completion. The ABET evaluator's checklist asks to use a worksheet if one is available, which would help in the time consuming process of determining hours of Math and Basic Science, Engineering Topics, and General Education. A color-coded Excel spreadsheet lists a normal template and all possible electives a cadet could select. By clicking on the courses taken, automatic hour totals can be calculated and color-flagged if ABET minimums are not reached.

Evaluators often state that 90% of the findings are done before the actual visit of an institution. The self-study points an evaluator into areas of interest during a visit, since there is little time allocated for a visit. In preparation for a visit, a thorough review of all public materials was completed. Catalogs, web sites, and other media were made consistent and plainly state what a graduate should be able to do after completion of the program. Special care was taken to insure that course objectives support program goals, which in turn support the Academy's goals. An excellent confirmation exercise is to follow and validate links between all levels.

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Student and faculty interviews are often the most overlooked part of a visit, but they can make the biggest impression on an evaluator. Role-playing the interview process is a good method to measure the overall climate and health of a program. Better answers can be obtained when compared to normal questionnaires, since an interviewer can probe and tailor his questions. Often the best questions to ask are the open-ended type, such as "What do you think of the program?" or "What would you like changed in this program?" The interview process can also be used to gauge the knowledge level of the ABET process. Early identification of personnel to be interviewed reduces stress and results in smoother planning.

Support From Non-Evaluated Programs

The support of other programs that are not being accredited by ABET were broken down into core courses (History, English, Leadership, Law) and service courses (Math, Chemistry, Physics). The overall administration of the core courses was done at the Dean's level, with all documentation recorded at a central location. This way any evaluator from the seven evaluated programs can have easy access to the core course documentation. It was determined that the core courses would be documented at a reduced level, to reduce workload and still meet evaluator requirements. Copies for each program were made of the Ethics and Military Training parts of the documentation, due to the high evaluator interest level in this part of the curriculum.

The service courses take a unique approach in their support of the engineering programs. Course directors try to tailor their course to the engineering discipline, so that students will gain an appreciation why they are learning math in preparation for their engineering major. Each service course objective is linked to the generic ABET criteria A-K to assist engineering program directors. By using links to a generic criterion, program directors can easily link service course objectives to program specific objectives. Carroll College received an ABET 2001 award for instituting this in their math program. [2]

DEPARTMENT LEVEL VISION AND GUIDANCE

The Department of Electrical Engineering and Computer Science has two accredited engineering programs. The electrical engineering program will be evaluated by the EAC; the Computer Science program will be evaluated by the CAC. There are many similarities between the types of visits, but many differences as well. As a result, the two programs have developed several internal controls, timelines, and processes. These all serve to ensure timely and correct completion of the self-study, capture of documentation, and satisfaction of other ABET CAC and EAC requirements.

Throughout the accreditation process, the department leadership had key goals concerning the course director. The leadership wanted to ensure that course directors and

other faculty received the right guidance for ABET preparations, could manage the additional administrative load during the record year, and understood that the documentation of the processes, while important, was secondary to how self and external examination improved the programs. Adding ABET record year processing to the already busy teaching schedule of the department faculty could have easily led to an unbearable year. However, because of excellent guidance and involvement from the senior faculty and department leadership, the entire process was quite manageable.

Understanding the Big Picture

The EECS department leadership played a major role in ensuring that everyone understood the big picture with the ABET process. A full semester before the record year, the department leadership carefully explained the entire ABET process to the entire department through a series of department meetings. They explained its purpose and why it was important for the department. Each program (CS and EE) in turn had further meetings that went into greater detail with each discipline.

Part of this educational process was understanding who the constituents were and how they played in the ABET accreditation process. This allowed the department faculty to see how the course, program and department objectives and outcomes fit into the big picture. In addition, the department leadership kept the rest of the staff and faculty informed about the overall purpose of the ABET visit and shared their insights and lessons learned from previous visits.

Outcome Monitoring

Another way the faculty were able to get a big picture of the ABET process was through their work as program outcome monitors. In addition to each course director being responsible for documenting how her course supported the outcomes and objectives of the ABET program, individual faculty members were assigned responsibility for documenting how the program as a whole supported a specific ABET outcome.

Each program outcome has an associated notebook with a recommended standard structure of sections separated by tabs. The outcome monitors were tasked to determine which courses throughout the program supported their specific outcome and to collect evidence from those courses that documents support of the outcome. This also allowed the faculty to get a better understanding of the entire program in general, and how her course fit into the program specifically.

Documentation Collection Guidance

EECS faculty received extensive guidance for documentation collection. Although a great deal of effort was committed to document collection for the record year, the department leadership continuously kept the faculty

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focused on how self and external examination improved the programs. Course directors were briefed on the purpose of the documentation and the important part it played in the accreditation process. To lessen the administrative load, the department leadership helped develop the standards and format for the course notebooks. This significantly simplified documentation collection. The requirements were well known, it was just a matter of meeting them.

At USMA, the standards for the documentation are set at the institutional level. Every course is required to prepare documentation of several areas in preparation for the visit. The documentation is broken into three notebooks: assessments, examinations, and other student work. The contents of the notebooks are tailored primarily for the EAC, but there are only minor differences in what is expected for the CAC. The first notebook contains assessments of the course conducted since the last ABET general review. The second notebook contains examinations, including the term-end examination if one is given for that course. The third notebook contains quizzes, homeworks, and other student work.

Similar guidance was issued for the preparation of curriculum vitae (CV) and course descriptions. Faculty members were given standard templates for each, and instructions for how to prepare them. Furthermore, one senior faculty member was designated as the CV and course description point of contact, responsible for clarifying issues about content and ensuring consistency within the program.

From a course director and instructor perspective, the ABET Preparation process was designed to be as minimally intrusive as possible. The department leveraged its existing information technology infrastructure to simplify the process of document collection, course description preparation, and curriculum vitae preparation. For example, guidance and samples were distributed electronically through email and on shared file servers, and word-processing templates were provided, simplifying the formatting by individuals.

With this proper guidance, faculty members were able to manage the additional administrative work load during the record year much more efficiently. Since guidance was clear and unambiguous, faculty members did not spend time trying to decipher what was required. Furthermore, since all documentation collection and CV development was standardized, there was little duplicated effort due to such things as incorrect formatting.

INTERNAL ASSESSMENT

Within the Department of Electrical Engineering and Computer Science, course assessment is documented in course outbriefs, or more recently, Course Summary and Proposal Reports (CSPRs). The information gathered in the CSPRs feeds directly into the course descriptions required by ABET. Faculty qualifications are represented by their curriculum vitae (CVs) which are trimmed to

demonstrate proficiency and currency rather than being exhaustive.

Course Summary and Proposal Reports

The purpose of the CSPR is to record the present iteration of the course and to act as a bridge to the next time the course is taught. The CSPR comes in two parts, the first written by the outgoing course director, the second by the incoming course director (often, they are the same person).

The outgoing course director describes how the course was conducted and her assessment of how well the course accomplished its objectives. This includes the enrollment, text books used, and the course grade point average. She then makes recommendations for the next iteration of the course.

The incoming course director examines the recommendations, designs the next iteration of the course, and meets with the program director to discuss the new implementation. This meeting is more than just an examination of the syllabus; it includes a review of the textbook, web site, and other materials, as well as an examination of the syllabus and schedule. The course director also has the opportunity to provide his or her philosophy for the course.

This process is how the two programs ensure that assessment occurs, that it gets documented, and that it is used to verify that each course fulfills its role in the curriculum. This is where the course director and program director verify the link between satisfaction of course outcomes and objectives with satisfaction of the outcomes and objectives of the program.

ABET Course Description Preparation

It is important to note that the CSPR is not a document prepared just to satisfy ABET requirements; rather, it is part of the normal assessment process. Although the CSPRs are designed for internal assessment of the courses, there is significant overlap with the course descriptions required by EAC and CAC for the self-study.

Once again, there is a single point of contact for preparation of the course descriptions. A common template for the course descriptions was developed and disseminated. Since they serve similar assessment purposes, it is not surprising that the CSPRs contain most of the information required for the ABET course description. The disciplined departmental assessment process ensured the information was captured. When the time came to produce the ABET course descriptions, it was merely a matter of making minor adjustments from the CSPR document that course directors had already completed.

Curriculum Vitae Preparation

A significant part of assessing the quality of any engineering program lies in determining the qualifications and currency of the faculty. The mechanism for doing so is the

preparation of Curriculum Vitae (CVs). Each faculty member use a CV template from a shared directory on the department's file server. After updating their CV, they placed it back in the shared directory for review by the CV coordinator.

The majority of the faculty members are active duty military officers who are assigned to teach at West Point for a three-year tour of duty. For those CVs, senior military and civilian faculty members provided mentorship on how best to translate descriptions of military duties that had a technical focus into language understandable by a civilian engineering professional.

THE ABET SELF-STUDY

Engineering programs that request an ABET visit are required to produce a written reply to the Questionnaire for Review of their program, commonly referred to as "the self-study." The self-study provides information that the visitors can review prior to their visit so that they can focus on areas that require the most attention. Although the self-study is not due to the ABET team until after the record year concludes, it is prudent to start work on it as early as possible.

At USMA, the self-studies from all seven engineering programs were started even before the record year began, and were periodically reviewed throughout the year. Most of these reviews were conducted internally by each program, with a status report provided to the ABET committee. In November of the record year, the self-studies were externally reviewed, as described above. The Mechanical Engineering Program and the Systems Engineering Program reviewed the Electrical Engineering Program. An ABET-certified visitor from the United States Naval Academy reviewed the Computer Science program. These internal and external reviews helped ensure the self-studies were thorough, and that institutional and department issues were consistently addressed.

Most of each self-study focuses on the individual program being reviewed. However, a good portion of it addresses institution-level processes and support mechanisms. Much of this information is the same for all programs. Where the information differed, usually an institutional entity (e.g., the registrar for enrollment data) was better able to prepare the information. For these reasons, the institution prepared an entire appendix, providing background and information about faculty, students, enrollments, funding, resources, and other areas common to all programs. The format of this appendix was tailored for the EAC. Rather than extract and reformat the information for the CAC, it was simply summarized in the Computer Science self-study and the appendix was added to the supplemental information.

Some information in the self-study can be filled in at the beginning of the record year. For example, many processes don't change within the record year, and are already

specified in official policies. At USMA, academic policies are specified in Dean's Policy and Operations Memoranda (DPOMs). These cover faculty recruiting, curricular change, resource funding, and many other areas of interest to the ABET visitors. Obviously, these policies are common for all of the programs. The ABET visitors are not asked to read through all of the relevant DPOMs; rather, they are also summarized in the self-study, with the actual DPOMs included in the supplemental material in case the visitors have more in-depth questions.

Other information is subject to revision, and must be updated prior to submission of the self-study. For example, information on the faculty curriculum vitae (CVs), such as publications and scholarly activities, may change even up to the last minute. Also, course descriptions might need to be updated, especially for courses in the spring semester of the record year. Such changes may cause formatting differences in the self study (especially page numbers). The Computer Science program places the CVs and the course descriptions into the supplemental materials. The supplemental materials can be easily updated without affecting the self-study.

Some information falls into both categories, where part of it can be recorded immediately, and part of it must be updated at the end of the record year. One example is enrollment data, which doesn't change for previous years, but may change due to attrition or changes of major during the record year. Another example is resource and funding data, in which historical budgeting information can be recorded initially, but final information can't be included until the record year is over.

CAPTURING STUDENT WORK

One of the biggest tasks in the record year is capturing examples of student work. Every course that is part of the major keeps original copies of student work for every graded event. Examinations, including the term end examination, if one is held for that course, are placed in the second notebook. Quizzes, projects, homework, and other work are placed in the third course notebook.

Documentation Collection

For each graded event, the course director extracts one example each of outstanding, fair to good, and poor student work. It's important to note that this categorization is not based just on the grades. Rather, the idea is to capture work that demonstrates how well students did or did not master concepts in the course. To ensure consistency between courses, a faculty member was appointed to become thoroughly familiar with documentation capture for ABET purposes and to serve as the single point of contact for questions.

The instructor solution is included so that evaluators can determine what would constitute a correct answer. In the case of a design problem with no single solution, the instructor files a grading sheet that enumerates the key

points that a good solution would address. In the case of courses with a large number of very small quizzes, not every quiz is captured. Enough quizzes are captured to demonstrate the general approach and the purpose of the quizzes.

Since it is standard practice at the military academy to return to the student all assignments except final exams, the instructor returned to the student a photocopy of the student work. As an alternative to using one of the standard photocopiers in the department, a scanner with an automatic document feeder was also made available on the internal department network. This allowed the instructor to electronically archive copies of student work.

Managing Capture of Student Work

Capturing the documentation requires some management at the program level, and in the case of an institution undergoing a multi-program evaluation, the institutional level. This documentation gets placed into a large number of course notebooks. For efficiency, the USMA institution centrally purchased the binders, as well as dividers and pre-labeled tabs for outstanding, fair to good, and poor work. All of the materials were distributed to the programs, who further distributed them to course directors.

Capturing documentation is a continuous process. To find representative examples, the course director must select from all the student work available. It is important to note that at USMA large courses are not taught in large classes. The maximum section size is 18 students. Such large courses have many instructors, under the supervision of a course director. In courses with small enough enrollments that one faculty member can teach all of the sections, that faculty member is the course director.

In large-enrollment courses, there are more student submissions to choose from, and there are multiple instructors. One approach to handle this is to have each instructor extract examples, then have the course director determine the most representative samples of the samples. Another approach is for the course director to designate one instructor (usually herself) to collect and collate the student work samples. Since the students are assigned randomly to the various sections of a course, it is possible to get a representative sample of the spectrum of student work from the students taught by a single instructor.

The program director can't wait until the end of the semester to make sure that capture is occurring; it is too difficult to recover student work after it has been returned. This means that the program needs a recurring check mechanism to ensure the work is being captured. These checks should not happen so often that they become a burdensome administrative load. They do need to happen often enough to make sure things haven't slipped through the cracks. At USMA, course directors are required to submit snapshots of course grades at the 6-week, 10-week, and 15-week points, as well as at the conclusion of the

academic term. This seemed like a natural place to add documentation collection checks.

The documentation checks are performed in a round-robin fashion, where each course director checks another course director's notebooks. This ensures a fresh eye is looking at the documentation, and it allows for cross-fertilization of ideas. In addition to student work, the first documentation check includes having the entire structure of the course notebooks set up and having the assessment data for all but the record year in place.

All documentation checks involve a comparison between the list of graded events in the course syllabus and the actual captured documentations. The nature of the captured documentation is not verified; it is up to each course director to insure that the captured student work is truly reflective.

To ensure that the documentation checks occur, a faculty member has been appointed as the documentation enforcer. He serves as the single point of contact for ensuring the student work is captured correctly and on time. By intention, this person is different from the person who provides guidance as to what is captured.

CONCLUSIONS

One of the most important things to remember in preparation for an ABET review is that the assessed processes are what's important, not the review. Another key idea is to start early: develop good processes, determine the accreditation requirements, and provide guidance to the institution and the faculty well in advance. Preparing for the review is then just a matter of capturing and portraying the effectiveness of the processes.

Preparations for an accreditation review require careful management to ensure that all required tasks are completed without making unnecessary demands on the program and its faculty. When an institution has several programs being reviewed simultaneously, this management must be centrally coordinated. Early determination and dissemination of the requirements and standards is key, as is clear and consistent guidance throughout. Programs and institutions being reviewed must develop and implement management and control mechanisms to minimize the administrative overhead of preparation and to ensure all requirements are being met.

Although the preparations and procedures described above are discussed in the context of the United States Military Academy and two of its programs, they should prove useful to any institution preparing for ABET EAC and/or CAC visits.

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