Graduate Program Review and Lessons Learned

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A Graduate Program Review and Lessons Learned

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Abstract

The Department of Engineering, Engineering Technology and Surveying at East Tennessee State University offers a graduate program – MS in Engineering Technology. The program has two concentrations – Engineering Technology and Entrepreneurial Leadership. The Engineering Technology concentration is for students who plan to become, or are now, involved in supervising or coordinating workers, materials, and equipment in a production system or who are resolving technical problems in the workplace. Individuals completing the program should be qualified to deal with tooling, methods, planning, quality control and reliability, safety and management aspects of production in manufacturing and other industries. The Entrepreneurial Leadership concentration was formed to provide students with skills that will help them thrive in the global economy of the twenty first century. The purpose of the Entrepreneurial Leadership concentration is to respond to the ever-increasing need for entrepreneurial leadership skills in the commercialization of innovative technology, and to respond to the broader application of entrepreneurial thinking in existing technology-based businesses, health care and higher education. This program is designed to provide the innovative, prudent risk-taker with a practical approach for commercializing innovative technology and for creating wealth by finding implementation methods for transforming creative ideas into value producing technology-based business models. Recently the program has gone through an academic review which is mandated by Tennessee higher education commission. This academic review is conducted every seven years and it is designed to improve the quality of the program and implement recommended changes in a systematic manner. The academic review consists of creating a self-study report and a site visit. The self-study focuses on learning outcomes, curriculum, student experience, faculty, learning resources and administrative support. A two-day long site visit was conducted by a panel of two external and two internal peer reviewers. This paper presents planning, preparation and lessons learned from this recent academic review of the program. Some of the highlighted lessons learned are plan early, develop and implement a continuous improvement plan, secure faculty and administrative support to drive success in a graduate program.

Introduction

Accreditation is an integral part of most undergraduate Engineering Technology (ET) programs in the USA. Accreditation bodies like ABET ensure that a program meets the quality standards that produce graduates prepared to enter a global workforce (ABET, 2019). Accreditation adds significant value to the students and enhance their employment opportunities. Employers feel confident that graduates from an accredited program have a solid educational foundation and are capable of leading the way in innovation, emerging technologies, and in anticipating the welfare and safety needs of the public (Blanco-Ramírez & Berger, 2014; Bailey, 2018; Staub, 2019). In addition, for professional licensure and certifications to a technical profession, all state licensure bodies require an accredited (such as ABET) engineering or ET degree as a minimum qualification (NCEES, 2020). Even though most ET undergraduate programs seek accreditation, that may not be the case for ET graduate programs around the country. In fact, ABET ETAC commission does not provide accreditation service for ET graduate program. In such case,

academic review is a valid alternative to ensure quality and continuous improvement of the graduate program.

The East Tennessee State University (ETSU) is a regional comprehensive institution in the state of Tennessee. The Department of Engineering, Engineering Technology and Surveying offers eight undergraduate programs and a graduate program MS in Engineering Technology. This graduate program provides students with opportunities to enhance their general, professional, and technical knowledge beyond undergraduate education. The program prepares them with skills and knowledge to be effective in dynamic technology-driven industries and businesses. The program is divided into two concentrations: Engineering Technology and Entrepreneurial Leadership. Over the last few years, the graduate program has seen significant growth. Student enrollment grew from 28 in Fall 2013 to 56 in Fall 2017. As such, number of degree awardees also increased with an average of 15 degrees conferred in each academic year. Table 1 shows MS in Engineering Technology enrollment data and degrees conferred in the last five years.

Table 1: MS in Engineering Technology Enrollment and Degree Conferred

Enrollment				Degree Conferred	
Term	Headcount	Term	Headcount	Academic Year	Degrees Awarded
Fall 2013	28	Spring 2014	26	2013-2014	15
Fall 2014	28	Spring 2015	32	2014-2015	9
Fall 2015	29	Spring 2016	28	2015-2016	12
Fall 2016	43	Spring 20117	42	2016-2017	13
Fall 2017	56	Spring 20118	53	2017-2018	24

Like most ET graduate programs, the MS in Engineering Technology program is not accredited by any accreditation body. As such the Tennessee Higher Education Commission requires such program to go through an academic review every seven years (THEC, 2015). Program review is important, primarily, to help identifying the strengths and weaknesses of the program and to help improving the program, with administrative support. The follow-up process after program review makes sure that planned changes are implemented in a systematic manner. Program review is also an important part of the Quality Assurance Funding (QAF) formula that constitutes a significant part of ETSUs income stream.

What is an Academic Program Review?

Academic program review is a peer review process designed to improve the quality of the university's academic programs. Program reviews provide a systematic method to evaluate quality, productivity, and need, both in the university and across the state and region.

The program review process takes place on a seven-year cycle. During the year of review, an academic program collaborates with the Office of Assessment to complete a self-study report and site visit. After reading the report and participating in the site visit, reviewers of the program will compile a narrative report that includes recommendations for improvement.

Programs create action plans based on these recommendations and present the outcomes of the program review to the Provost and others involved in implementing changes. Ongoing tracking of recommendations and outcomes continues throughout the cycle, until the next review. The follow-up portion of the program review cycle provides the vital link that enacts improvements brought to light in self-study and peer review processes.

Details of Academic Review Process

The academic review process is an intensive team effort and it involves significant time to plan and conduct the review process. Table 2 provides a timeline for the academic review process. The process starts with meeting with the director of assessment who goes over the review process and deadlines. After this meeting, the program needs to identify and assemble a reviewer

Table 2: Timeline for the Program Review Process

Activity	Deadline
1. Meet with the Office of Assessment to go over handbook and process.	September 15th (year of review)
2. Recommend and rank potential reviewers; recommend site visit date. Send to Office of Assessment.	October 1st
3. Receive data from Office of Assessment.	October 1st
4. Begin writing self-study.	Fall semester
5. Submit self-study draft to Office of Assessment.	End of fall semester
6. Edit self-study draft based on recommendations from the Office of Assessment. Return to Office of Assessment.	January and February
7. Finalize site visit schedule	1 months before site visit
8. Office of Assessment distributes self-study to reviewers and campus administrators; department distributes to program faculty and staff.	3 weeks prior to site visit
9. Site visit occurs.	Spring semester, typically during mid-February to late-April
10. Review team submits narrative report	1 month after site visit
11. Office of Assessment distributes narrative report to Department chair, Dean, and others involved in site visit; department distributes to program faculty and staff and initiates discussions regarding improvement	1 week after receipt of narrative report
12. Office of Assessment meets with department chair and college dean to discuss recommendations and identify outcome(s) to be added to program's IE plan.	Before November of next academic year
13. Office of Assessment enters outcomes into IE plan.	By December of next academic year
14. Department report on progress of outcomes annually.	July 1st (annually)

team. A team of 4 to 6 members - 2 to 3 external reviewers (at least one from outside the state of TN), and 2 to 3 internal consultants is recommended. All reviewers must meet the qualifications delineated in Table 3. The external reviewers must be professionals in the field under review and have no personal or professional affiliation with members of ETSU's faculty in the program involved in the self-study. Of the two to three internal consultants, one should be from within the same college as the program under review; one should be from outside that college. The internal consultants can provide important campus-related information to external reviewers, but they are still key members of the reviewing team, providing insight from within the university but outside of the program. The team needs to be approved by the academic affairs of the ETSU. The Office of Assessment does not pay reviewers or consultants for their

services. However, the office reimburses external reviewers for travel costs and provide the *per diem* rate for meals and incidentals. Departments may choose to offer honoraria, although this is not an expectation.

Table 3: Qualification of Review Team

External Reviewers	Internal Consultant
External Reviewers must: 1. Be professionals in the field under review; 2. Hold a terminal degree; 3. Hold an academic position, preferably at a regional public university comparable to ETSU; in some cases a practicing professional in the field or a retiree is an appropriate substitute; 4. NOT be ETSU graduates; 5. NOT have active or previous professional or personal affiliations with faculty in department to be reviewed, or with other reviewers (co-author, classmate, professor/student, former colleague, etc.); It is recommended that each of the following qualifications is held by at least one reviewer: 6. Chair of Department or coordinator experience; 7. Training/experience as a program reviewer.	**Internal consultants must:** 1. Be ETSU Graduate Faculty (if graduate program is reviewed); 2. Be faculty members outside program being reviewed; 3. Not be co-author or co-creator with department faculty.

A self-study report is prepared and distributed to the review team prior to the site visit. At the end of the site visit, the review team prepares a narrative report and presents it to the department Chair, Dean, Provost, office of Assessment and others involved in the process. The office of Assessment then meets with the department Chair and Dean to discuss recommendations and program improvement plans.

Academic Review of MS in Engineering Technology 2018-19

As the Graduate Coordinator (GC) of the program, the author initiated the process by meeting with the director of the OA in early summer 2018. The GC identified data needs from the college, the graduate studies, facilities, computer information systems, libraries, institutional research and other support groups. Concurrently the GC assembled the review team and have the team approved to conduct the site visit. Two external reviewers were Associate Deans from two reputed universities (one of them was from the state of Tennessee) with graduate programs in ET. Among the internal consultants – one was the Chair of Environmental Science and other was a full professor in the College of Business and Technology.

One of the main tasks of this academic review was to prepare a self-study report to describe the program thoroughly. The Office of Assessment provided an outline to organize the report. The outline had seven sections (or criteria) and each section provides a description of that aspect of the program (focusing on the last 5-7 years), any data available to describe or measure that item. The following description provides a brief over of the self-study report.

A. Introduction

This section provides a brief history of the program, including any critical events that have taken place since last self-study and major improvements that have taken place since the last program review. Positive features such as features that make this program

innovative, outstanding, or unique are included in this section. This section also provides a description of strengths, weaknesses, costs, and benefits of the program.

B. Learning Outcomes

This section mainly focuses on program's student learning outcomes, results of outcome measures and use of outcome data. The graduate program curriculum provides new graduates with the advanced knowledge, experience, and tools needed to develop their skills to apply, interpret and manage situations that occur in the changing technology-based workplace. The MS in Engineering Technology is offered through two concentrations: 1) Engineering Technology and 2) Entrepreneurial Leadership. For each concentration, there are five specific student learning outcomes (SLOs) as outlined below.

1. Communicate effectively in technical writing, oral presentation and graphic design to meet the standards of APA and other standard technical writing styles.
2. Collaborate effectively as a team member and/or a leader to solve class-based case studies and/or industry provided problems and issues.
3. Demonstrate advanced technical knowledge and mastery of subject matter.
4. Develop and apply methods to setup, acquire and analyze information needed to solve technical problems.
5. Apply various manufacturing control methods such as Lean, Six-Sigma, Concurrent Engineering, Agile Manufacturing and others (Engineering Technology Concentration Only).
6. Demonstrate the ability to generate viable and innovative ideas of products and services for new and existing industry (Entrepreneurial Leadership Concentration Only).

Figure 1 illustrates development of program student learning outcomes and continuous improvement process. Student learning outcomes are developed with the consultation of the graduate faculty committee, Industry Advisory Board (IAB) and alumni, who are the constituents of the program. Data are collected every three years to assess the attainment of the learning outcomes. Analyzed data are presented to the graduate faculty committee to identify improvement needs. Approved improvements are implemented and assessed. The learning outcomes are periodically reviewed by the constituents to ensure that learning outcomes are still valid and relevant to reflect the needs of the industry. Student learning outcomes are developed with the consultation of the graduate faculty committee, Industry Advisory Board (IAB) and alumni, who are the constituents of the program. Data are collected every three years to assess the attainment of the learning outcomes. Analyzed data are presented to the graduate faculty committee to identify improvement needs. Approved improvements are implemented and assessed. The learning outcomes are periodically reviewed by the constituents to ensure that learning outcomes are still valid and relevant to reflect the needs of the industry.

Student learning outcome (SLO) assessment data were collected in academic years 2014 and 2017. For each SLO there are few performance indicator and data were summarized

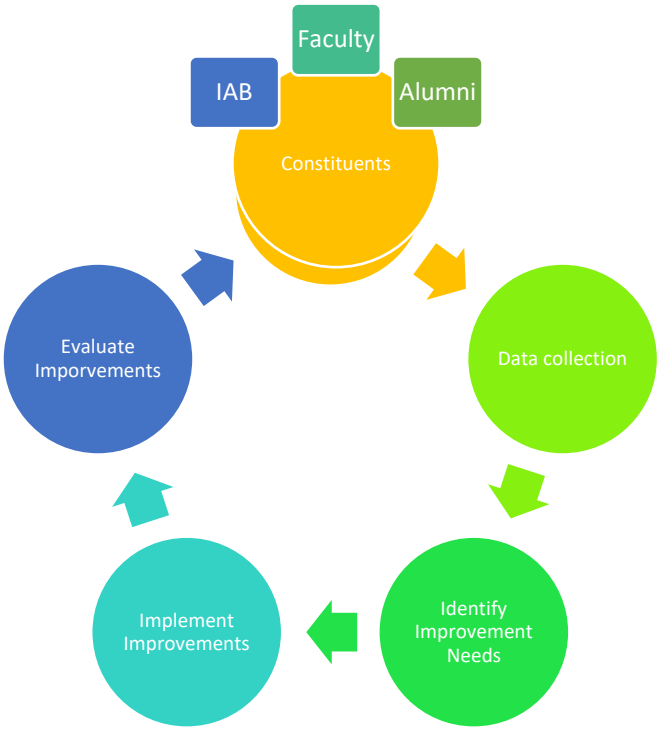

Figure 1: Establishment of Program Student Learning Outcomes and Continuous Improvement

based on these indicators to measure SLO. Appendix A shows criteria for each SLO. Three courses: ENTC 5010 Modern Industry, ENTC 5800 Strategic Experience and ENTC 5950 Methods of Research and direct assessment tools: assignment, final exam and course project were utilized for data collection. Data were summarized on a three-point scale: 0- Does not Meet Expectations, 1- Meets Expectations and 2- Exceeds Expectations. A weighted average target of 1.2 is used to measure the attainment of SLOs. Summarized results show that students met or exceed expectations in all six SLOs. Average score for SLO#1 to SLO#6 were 1.22, 1.67, 2.00, 1.35, 1.48, and 1.82 in 2017 assessment cycle. It is evident that students met the average target outcome of 1.2 in each of the SLO. There has been a 14% and 8% improvement in SLO#5 and SLO#6 between 2014 and 2017, SLO#3 and SLO#4 remained relatively same. However, a downward trend has been seen for SLO#1 and SLO#2.

C. Curriculum

This section highlights the curriculum of the graduate program including any technical core, capstone experience and credit hours needed for graduation. For the graduate program students are required to declare their concentration of interest in their admission application. Once enrolled, a student must select one of the following two tracks:

Thesis Track: Requires at least 30 credit hours, including ENTC 5960 Thesis.

Non-thesis Track: Requires at least 36 credit hours, including ENTC 5800 Strategic Experience.

For both tracks and concentrations, all graduate students have to complete a 9 credit hours of general core, a 9 credit hours of concentration core, a 3 credit hours of thesis or strategic experience and a 9 -15 credit hours of approved electives as show in Table 4.

Table 4: MS in Engineering Technology Curriculum

	Entrepreneurial Leadership Concentration[1]	Engineering Technology Concentration
General Core	ENTC 5030 Investigation in Technology (3) ENTC 5950 Methods of Research (3) MGMT 5010 Essentials of Management (3)	ENTC 5030 Investigation in Technology (3) ENTC 5950 Methods of Research (3) MGMT 5010 Essentials of Management (3)
Concentration Core	MGMT 5617 Small Business Management (3) BADM 5370 Entrepreneurial Finance (3) ENTC 5640 Innovative Entrepreneurship (3) OR MGMT 5640 Innovative Entrepreneurship (3)	ENTC 5630 Project Management (3) ENTC 5010 – Modern Industry (3) ENTC 5170 – Strategic Management of Technology and Innovation (3)
Thesis/Non-Thesis Track	ENTC 5960 Thesis (3) and/or ENTC 5800 Strategic Experience (3)	ENTC 5960 Thesis (3) and/or ENTC 5800 Strategic Experience (3)
Electives	9-15 credit hours approved elective courses	9-15 credit hours approved elective courses

A curricular mapping is provided which links courses to student learning outcomes. Graduate students are accepted into the program with the assumption that they have a sound working knowledge in at least one of the major disciplines of engineering/engineering technology. Each graduate core course builds on the foundational principles and outcomes of the undergraduate curriculum and are covered in greater detail and more comprehensively, meaning graduate students develop an enhanced understanding of theory and practice in their concentration of study. In addition to coursework, graduate students complete a minimum of 3 credit hours of research/project work (ENTC 5960 Thesis and/or ENTC 5800 Strategic Experience) under the supervision of faculty. Being project specific, students are exposed to the research process of engineering problem solving and the development and applied methods to setup, acquire and analyze information needed to solve technical problems. Many students are then part of the process of communicating their research work in

[1] For Entrepreneurial Leadership concentration thesis track students required to take both ENTC 5960 and ENTC 5800

written publications, posters, and oral presentations at local, state and national meetings. This experience is effective at giving graduate students an opportunity to practice effective communication of scientific research work.

The curriculum utilizes both traditional and modern technology in order to enhance student learning. Most of the department's classrooms are multi-media classrooms, which provide computers and smart boards. The department has six computer labs which are loaded with the latest software and tools for all students to use, including the graduate students. The electronics lab, manufacturing lab, robotics and 3D printing lab, and construction lab are widely used for graduate course content delivery and research activities. These labs are equipped with the latest equipment and tools to prepare students with relevant technical skills. Graduate students are also introduced to a number of different software during their lecture courses and research. These are AutoDesk products, Minitab, Microsoft Project, LabView, DecisionTools, Adobe products, and Microsoft office.

In 2016, DENSO North America Foundation (NAF) awarded the department a $72,000 grant to purchase 3 feedback 340-120 dual conveyor systems and 4 feedback motor test benches. These new systems provide students with a lab-based experience to interface high voltage motors which are used in multiple manufacturing processes, including transport, automation, and milling. Also, as more electric vehicles are coming on-line, these benches provide the background training for the application of electric motors in powertrain applications. Most recently, in 2017, DENSO NAF awarded the department another $100,000 grant, which was used to purchase two new robot with RC8, two standalone RC8 controller, four license of DENSO Digimetrix Software, three Raise3D N2 dual extruder 3D Printers, two Form 2 3D Printers, and ten Maker Select 3D Printers. The upgraded robotics and 3D printing labs were put into use immediately. The ENTC 4517/5517 Industrial Automation and Robotics class was the immediate beneficiary of the upgraded robotics lab with advanced hands-on training on automation and control systems. The new equipment has resulted in improved student learning experiences.

D. Student Experience

This section focuses on student satisfaction and experiences in the graduate program such as critical mass and peer relationships among students, application of learning, professional and career opportunities, and academic support services. The average size of our graduate level courses is approximately 15 students. Such class size often creates an engaging environment and students are much more likely to interact with the professor rather than listen passively during class, which contributes to student success. These students, while collegial and professional, compete with each other to be the best that they can be in their respective classes. Students entering in the MS in Engineering Technology program have solid backgrounds in one of the disciplines of engineering or technology and most of them progress well in the program. However, students who are weak in a subject area such as ENTC 5950 Research Methods, feel comfortable requesting and receiving help from their professors and peers. Most of the graduate students work well together; they encourage each other, study together, and enjoy challenges. They must also work together in teams on projects.

The MS in Engineering Technology curriculum provides students a great deal of opportunity to apply their knowledge in the real world while in the program. Two core courses: ENTC 5030 Investigation in Technology and ENTC 5800 Strategic Experience are specially designed for this purpose. One of the main topics of ENTC 5030 is engineering data analysis. For the course project, students are required to find a local company which presents them a technical data driven problem. Students, working in a team, investigate the problem, collect and analyze data using statistical tools and techniques, and devise a solution, which they present to the company. ENTC 5800 which is a required course for non-thesis track students, serves as the capstone project course for graduate students. The Industry Advisory Committee is very active in providing students various real-life working opportunities, such as course projects and internships. Most graduate faculty members also bring guest speakers from various industries who discuss applications of class learning to real life. Graduate students are also encouraged to intern during the summer months.

MS in Engineering Technology students receive regular advising. All new graduate students are advised, initially, by the department's graduate coordinator. The graduate coordinator helps the students arrange their first and second semesters of classwork, with attention to any work that must be completed for prerequisite or conditional admission reasons. Besides the graduate coordinator, graduate faculty members and the department chair actively advise graduate students to make sure that they are on the right track to graduation. After the second semester, students may still consult the graduate coordinator for advice, as well as their thesis advisor. At the beginning of their last semester, students consult with the graduate coordinator and prepare graduation paperwork. The graduate coordinator makes sure all requirements are fulfilled including the courses in the last semester, and sign off on the paperwork.

Graduate students receive professional and career support through the College of Business and Technology (CBAT) and the University Career Services Office. Director of CBAT Career Services and her office deliver a wide array of services designed to assist and support students as they prepare for a career. The following are some of the services and programming available to students across the College:

- One-on-one job search strategy sessions;
- Weekly Email Update e-newsletter, sharing jobs, internships, events, and recruiting information to students by academic department;
- Career Services coaching/counseling sessions on resume writing, interviewing, corporate dress, conducting a strategic job search, and networking;
- Personal resume critique and LinkedIn profile critique;
- Mock interview sessions;
- A multitude of career-related resources, both print and electronic;
- College of Business and Technology (CBAT) Career Services web site at www.etsu.edu/cbat/careerservices;
- CBAT Career Fair Corporate Sponsor Class Talks (many times featuring alumni) and Career Fair which offer opportunities for skill development and employer interaction;

- CBAT@Work Networking Career Social to promote alumni, student, and employer engagement in a less structured environment while allowing students to practice networking skills;
- On-campus recruiting;
- Internship/Co-op programs, through the College of Business and Technology
- Employer presentations;
- Student Executive Briefings, featuring alumni and professionals with close ties to the college.

The CBAT Director of Career Services meets with students by appointment to help them clarify goals, begin the professional visioning process, and sharpen job-seeking skills, such as resume writing, LinkedIn, cover letter writing, interviewing, and job search methodologies—in preparation for both internship/co-op searches, as well as full-time job searches.

Graduate students are alerted to open positions and internships via the Weekly Email Update e-newsletter. In addition, Loretta Fritz, the systems manager in the department, sends out notifications on various job opportunities to department student lists. The graduate advisor and faculty are notified and asked to share information with students as well. Graduate students can participate in internships; however, they do not receive credit for it.

E. Faculty

This section highlights graduate faculty members and their roles and responsibilities including faculty development, preparation and faculty involvement for program improvement. There are twenty-nine instructors in the Department of Engineering, Engineering Technology, and Surveying. Of those, eighteen are considered graduate faculty members and have teaching, research, and service responsibilities in the Technology program. Of the eighteen, three are full professors, five are associate professors, three are assistant professors, two are lecturers, and five are adjunct instructors. The following table shows the different levels of the department's full-time faculty and the approximate percentage of their time devoted to teaching, research, and service. Since lecturers have graduate degrees and the necessary industry expertise they can serve on thesis committees as a member but not as a chair.

Table 2: Faculty Teaching, Research and Service Responsibilities

Faculty Appointments	Teaching	Research	Service
Tenured/tenure-track	50%	30%	20%
Lecturer	80% to 100 %		0% to 20%
Adjunct	100%		
Emeritus	100%		

All graduate faculty have education and industry expertise that align with the graduate courses they teach and current graduate faculty assignments meet the needs of the program.

Faculty members in the Department of Engineering, Engineering Technology and Surveying have access to a full range of resources for professional development, including workshops, seminars, classes, and travel to conferences and other events. Faculty regularly attend the Appalachian Student Research Forum held at ETSU, national meetings of the American Society of Engineering Education, Conference of Industry Education Collaboration, and Tennessee Engineers' Conference, as well as conferences based on their research interests, including international conferences. All department faculty, especially tenure-track faculty members, are encouraged to attend educational workshops aimed at the improvement of the level of teaching and incorporation of new teaching methods and technologies into the educational process in particular. The goal for the next 5 years is to increase the number of educational workshops tenure-track faculty attend.

The Department provides an annual travel budget to support faculty travel to conferences. Additional monetary support can be obtained from the College, School of Graduate Studies, and Office of Research and Sponsored Programs (ORSP). The University also recently opened a Center for Teaching Excellence (CTE), which provides instructional development opportunities for faculty, serves as a "one stop shop" for teaching resources, and creates a community of practice among faculty. The CTE provides workshops and guest speakers on a variety of topics, as well as a book club and faculty learning communities. ETSY+U encourages faculty members to participate in professional development. Faculty and staff can receive education expense support when pursuing additional degrees. The University provides financial support through grant awards and other means that cover research, scholarly and creative activity, professional service, and for faculty participation in major activities of their respective professional associations. These include instructional development grants and Presidential Grant-in-Aid, among others. The University also recognizes outstanding faculty members for teaching, research and service, each year. The awards are accompanied by a financial reward.

Faculty members in the Department have been awarded a total of $883,859 in external funding over the past 5 fiscal years (2013-2018). The bulk portion of the grant money was used for lab equipment and materials and has significantly improved students' learning and lab experiences. A small portion of grant money was utilized for graduate student stipends. Graduate students are frequently involved in manuscript writing and conference paper publications.

F. Learning Resources

This section mainly focuses on classroom, labs, library resources and equipment to support the graduate program. The Department is housed in the Wilson Wallis Hall and has following facilities and labs:

- Ground Floor: Three classrooms, faculty offices and two labs (mechanical engineering and electrical engineering lab)
- First Floor: Three classrooms, faculty offices, one computer lab, manufacturing lab, construction lab, robotics and 3D printing lab, and surveying lab
- Second Floor: Three classrooms, department offices, faculty offices, three computer labs, electronics lab, biomedical lab and wood working lab

All classrooms are multimedia classrooms with online teaching capabilities. Computers in all labs are equipped with the latest software for teaching and research. Although most labs are dedicated to undergraduate programs, graduate students have full access to all the labs to conduct research and project work.

Engineering Technology graduate students have access to a great deal of academic support services at ETSU. The Charles C. Sherrod Library, ETSU's main campus library, offers a large variety of journals, texts, and other educational material that students can access. The library performed an assessment of the holdings related to the Technology program, their report is provided in Appendix J. Educational material not available at the library can be obtained through the Inter-Library Loan service. Located on the first floor of the Sherrod Library is the Center for Academic Achievement (CFAA) which includes Learning Services (Tutoring) and Testing Services. The mission of the CFAA is to present students with opportunities to learn and demonstrate their learning in a secure and supportive environment that encourages creative thinking, collaborative learning, and self-direction. Learning Services provides tutoring in a variety of subject matters, including Technology and writing. The CFAA has a number of tutors that specialize in assisting foreign students with their writing skills. Testing Services provides a secure location for administering tests via paper or computer. Some faculty members use the testing center throughout the semester.

The Library also houses the Graduate Student Success Specialist Service, which is sponsored by the School of Graduate Studies and offers students confidential advice concerning life issues that impact their academics. Other workshops and programs that are available to graduate students through the School of Graduate Studies include Thesis and Dissertation preparation workshops, Thesis and Dissertation Boot Camp, and Research Grants as well as professional development courses (e.g. Teaching Pedagogy for the Graduate Assistants, Responsible Conduct of Research, The Art of Self-Marketing, and Leadership for Professionals). Current collections and services of and housed within the Sherrod Library adequately support the areas of Engineering Technology and Entrepreneurial Leadership for the program's students.

The Office of Information Technology Services (ITS) offers a wide array of services to graduate students and graduate faculty that enhances the teaching and learning environment.

- ITS provides assistance with multimedia classrooms, computer labs, networking, telephones, computer replacement, server support, administrative system support, desktop computer support and personal technology.
- ITS offers administrative system support with the University's Student Database software, Banner, and Antivirus assistance, as well as purchasing assistance for personal computer purchases.
- ITS maintains an agreement with Microsoft for their software which allows students, faculty, and staff to purchase Microsoft software for personal use at a discount.
- Access to certain software for PC and Mac platforms is available through ITS.

- The ITS help desks (both student and faculty/staff desks are available) attend to any computer-related problems.

G. Support

This section discusses the budgetary support for the graduate program. Most department budgets are allocated toward undergraduate program and often no departmental funds were available for graduate recruiting, course support, research work, etc. However, upgrade of labs equally benefits the graduate program. Graduate students receive travel support from the Department/Dean of CBAT/graduate studies for presenting their research work at scientific meetings. The Office of Research and Sponsored Program hosts Appalachian Research Forum on campus where graduate students present their research in the form of oral and/or poster presentations. Graduate faculty members are encouraged to seek major and minor grants from the ETSU Research and Development Committee which funds many graduate research projects for preliminary data.

Lessons Learned

The academic review of the MS in Engineering Technology program was successful. Through this experience authors have gained valuable knowledge which are listed below.

Start Early

Planning and developing a self-study report requires significant time. Data and information needed from different parts of the department, college and the university can be time consuming. Therefore, starting early and securing support of the graduate faculty members go a long way in preparing and on time submitting of the self-study.

Develop an Articulated Assessment Model

A very planned out assessment model does wonder for facilitating the gathering and use of data. However, a common mistake that is often made regarding assessment is, a program responds to external demands by an accrediting body or program review team. Normally, there is an assortment of assessment information across the department, college and university. Many of the assortments of information may include, but not limit themselves to assessment timeframes, data collection timeframes, data collection methods, document format and the like. It is very important to learn what the program review agency or accreditation agency require in reference to requirements. Once this information is determined, it is important to standardize the process so that all individuals involved in the process will can clear communications of expectations and materials produced appears to be written in one voice. Engage all the constituents but start small with a limited number of talented faculty who has an expertise in assessing student outcomes, academic planning and goal setting.

Long- and Short-Range Academic Program/Department Goals Should Reflect a University's Strategic Plan

In most cases, strategic planning is ongoing and typically involved most if not all areas of the university. It is important to make sure that a part of the voice of the university's strategic plan reflects your area(s) of assessment. Normally when strategic plans are being developed, working teams are put in place to address the various components of the university. This is the time to get involved to have a voice at the table.

Identify Talent Among the Faculty

Identifying the right faculty and staff to lead the preparation process for a program review is critical. Typically, there are very talented faculty and staff with a passion for program review and assessment among those who make up a department or program. It is very important that you tap those individuals to lead the process. They will go the extra distance to do a good job and they have the potential to bring others along without a program leader or department chair pressure individuals to do their part.

Conclusions

The graduate program MS in Engineering Technology in the Department of Engineering, Engineering Technology and Surveying at ETSU went through an academic review to ensure quality and continuous improvement of the graduate program. Some of the key elements of the successful academic review were planning early, developing and implementing a continuous improvement plan, securing faculty and administrative support and being the champion of the program. Program assessment is critical for improving student outcomes. There are many engineering and engineering technology program across the country. However, not all programs are equally effective, but yet, many compete against each other. If programs and universities continue to have bold missions that promises top quality education, continuous improvement must be imbedded in the mission of the institution and therefore assessment become paramount to plan and track progress of individual programs.

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Appendix A: Assessment Rubric for MS in Engineering Technology

Assessment Rubric for Student Learning Outcome (SLO) 1

Communicate effectively in technical writing, oral presentation and graphic design to meet the standards of APA and other standard technical writing styles

Course and Element: ENTC 5950 Methods of Research – Class Assignment

Criteria	0 - Does not meet expectation	1 - Meets expectation	2 - Exceeds expectation
Student uses APA format or other standard technical writing styles for paper and uses legitimate and varied sources			
Student introduce topic and presents clear ideas/arguments			
Student uses graphical information/data (e.g., charts, graphs) appropriately			

Assessment Rubric for SLO2

Collaborate effectively as a team member and/or a leader to solve class based case studies and/or industry provided problems and issues

Course and Element: ENTC 5950 Methods of Research – Group Assignment

Criteria	0 - Does not meet expectation	1 - Meets expectation	2 - Exceeds expectation
Team operates synergistically and utilizes each member's skills			
Team accomplishes goals established by the instructor			

Assessment Rubric for SLO3

Demonstrate advanced technical knowledge and mastery of subject matter

Course and Element: ENTC 5800 Strategic Experience – course project

Criteria	0 - Does not meet expectation	1 - Meets expectation	2 - Exceeds expectation
Student uses classic and/or current tools and references			
Student can synthesize and apply subject matter studies in previous courses and apply them to a realistic problem solving effort			

Assessment Rubric for SLO4

Develop and apply methods to setup, acquire and analyze information needed to solve technical problems

Course and Element: ENTC 5950 Methods of Research – Final Exam

Criteria	0 - Does not meet expectation	1 - Meets expectation	2 - Exceeds expectation
Student accurately formulates research questions			
Student can effectively use analytical/statistical software to capture and analyze data and interpret the results			

Assessment Rubric for SLO5

Apply various manufacturing control methods such as Lean, Six-Sigma, Concurrent Engineering, Agile Manufacturing and others.

Course and Element: ENTC 5010 Modern Industry – Final Exam

Criteria	0 - Does not meet expectation	1 - Meets expectation	2 - Exceeds expectation
Demonstrates an understanding of various manufacturing control methods such as Lean, Six-Sigma, Concurrent Engineering, Agile Manufacturing			

Assessment Rubric for SLO6

Demonstrate the ability to generate viable and innovative ideas of products and services for new and existing industry

Course and Element: ENTC 5800 Strategic Experience, course project

Criteria	0 - Does not meet expectation	1 - Meets expectation	2 - Exceeds expectation
Understand an approach for identifying start-up opportunities in technology based business and/or new program development opportunities in existing organizations			
Select a specific technology or new program innovation, identify the market, and generate a successful business plan			