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Answering a Renewed Call for Action in Engineering Technology

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Introduction

The 2013 Engineering Technology Leadership Institute (ETLI) meeting in Washington, D.C.[1] was organized in a bold new format that promises results in addressing Engineering Technology (ET) concerns. Holding ETLI in the nation's capital increases the involvement of key members of federal organizations that affect ET's well-being, thus placing ET in a national spotlight. The panelists expressed their views and offered an opportunity for participants to discuss issues relevant to re-branding ET, global perspectives on educating engineers, the role of industry in engineering education, and strategies that expand the supply of engineers. Although there is always room for logistics improvements, kudos to the organizers for their vision of the future of ETLI and for rekindling a national call for action.

This article responds to the call by providing specific recommendations that address four important issues affecting the national ET community. Two of the recommendations call on the Engineering Technology Council (ETC) leadership for further action. The issues are coupled and not new; but the dialogue should provoke short- and medium-term concrete actions. First, the article advocates a succinct definition of *technology* and by association, a clear description of *engineering technology* in favor of supporting and growing the B.S.E.T. degree and against proposals made at the ETLI meeting and elsewhere to rebrand ET as General Engineering or Applied Engineering which would subsequently lead to the elimination of the B.S.E.T. degree. Second, a features table is drafted based on the ASEE annual profile metrics for the purpose of restarting the conversation on national ranking of ET programs. Third, the article promotes the need for universities to work toward establishing and nurturing graduate ET programs as a means to strengthen ET's footing in academics and scholarship. A generic M.S.E.T. degree plan is offered as a starting guide. And finally, a cost-effective national marketing strategy is outlined to significantly increase ET awareness in the community.

On Rebranding ET: Is there really a problem?

During the 2013 ETLI meeting, a proposal was presented which would rebrand ET as General Engineering so that the degree would become a B.S. in General Engineering with a major in Electrical ET for example. Long-time participants of ETLI and other gatherings often reminisce that ET was an unfortunate name choice and that the degree should have been called Applied Engineering. Others in the audience suggested that dropping the 'T' in B.S.E.T. and renaming the degree as B.S. in Engineering with a major in Mechanical ET for example could be a solution. One advantage given for this type of rebranding – essentially dropping the 'T', is that ET accreditation would now be the responsibility of EAC, leaving ETAC to accredit 2-year technology programs. Yet another suggestion is to drop the 'E' from ET. Although advocates may issue well-intended motives for the validity of such proposals, we reason that rebranding is unnecessary, it is at best ineffective and at worst may be entirely devastating for ET programs across the nation.

First, there exist about 60 programs in the US that offer the B.S. or B.A. in General Engineering[2]. The degree often points to a more flexible curriculum allowing students to explore areas of their interest with an interdisciplinary or cross-disciplinary flavor that may involve the applied sciences and other non-engineering fields. Programs may specify a multidisciplinary approach to solving engineering problems, an emphasis on communications and team-work, and most degree plans have a concentration or focus area. However, ET has a well-established educational philosophy and quite a different mission. The proposal to rebrand ET as General Engineering essentially eliminates the existing 4-year B.S.E.T. in over 100 institutions, puts ET faculty at odds with their teaching philosophy, and adds potentially 6,000+ graduates with a weakened job prospect to the General Engineering supply.

Second, while it is well known that engineering programs became much more science-based in the years following the 1955 Grinter Report[3,4], contrary to science degrees both engineering and ET degrees are already deemed to be applied. In the past decade recruiting and retention pressures have led engineering departments to increase the use of applications, project-based and hands-on terminologies in their program descriptions to the point that many are starting to sound a lot like ET plans. Moreover, engineering and ET faculty will acknowledge that their programs are applied. Although some may wish to argue that ET is the more applied degree, this line of thought has yet to attract a strong following or produce a concrete action plan for an Applied Engineering brand for ET. Nevertheless, a quick internet search for Applied Engineering Departments (February 2014) yielded the list of institutions in Table 1 that have programs or departments with an Applied Engineering or Applied ET brand. It appears that a common educational thread in these programs is the merger of engineering and management skills. Indeed, several of these programs secure accreditation by ATMAE, the Association of Technology, Management and Applied Engineering.

Third, dropping the ‘T’ from the B.S.E.T. degree is highly problematic because many ET programs thrive outside engineering colleges or schools, for example in a College of Technology (Purdue University, University of Houston), or in a College of Applied Science & Technology (Rochester Institute of Technology). Hence, it would be an insurmountable challenge for the administrators of such programs to be granted the authority to offer an engineering degree, as opposed to an *engineering technology* degree. In fact, the General Engineering and Applied Engineering rebranding proposals would probably encounter the same challenge. If any of these proposals were to be implemented, many ET programs would necessarily have to be absorbed by engineering schools.

Finally, dropping the ‘E’ is for numerous programs tantamount to returning to their decades old origins in the Bachelors of Technology degrees, a move that will not generate traction either. Hence, any rebranding proposal is deemed altogether a nonstarter.

Instead of rebranding ET or continuing to compare and contrast ET with other engineering programs, this article advocates a simple yet effective definition of technology and by association ET partly because for many decades ET programs have owned the combination of the words ‘engineering’ and ‘technology’. Definitions of technology have been passionately debated relative to science, to engineering, and to its impact on society; however, as far as the ‘E’ and the ‘T’ are concerned in STEM, we propose the following simple interpretation:

Table 1 Partial List of Departments or Programs with an Applied Engineering (AE) or Applied ET Brand
(Source: Internet search, February 2014)

University of Arkansas at Pine Bluff (AK) / School of Arts & Sciences	www.uapb.edu/academics/school_of_arts_sciences/ industrial_technology_management_and_applied_engineering.aspx
Jacksonville State University (AL) / Department of Tech & Engineering	www.jsu.edu/edprof/tech/undergraduate.html BS Applied Electronics Engr.; BS in Applied Manufacturing Engr.
Eastern IL University (IL) / School of Technology	www.eiu.edu/tech/prospective-bs-aet-degree-index.php BS AE & Technology (formerly BS Industrial Technology)
Indiana State University (IN) / Department of AE and Tech. Mgmt.	www.technology.indstate.edu/AETM
Morehead State University (KY) / Department of AE & Tech	www.moreheadstate.edu/aet
Eastern Kentucky University (KY) / Department of AE & Tech	www.technology.eku.edu
Eastern Kentucky University (KY) / College of Business and Technology	www.cbt.eku.edu/cbt-academic-programs BS Applied Engineering Management
Michigan State University (MI) / Department of AE Sciences	www.aes.egr.msu.edu BS AE Sciences (various concentrations)
Bemidji State University (MN) / Department of Tech, Art & Design B.A.S. in Applied Engineering	www.bemidjistate.edu/academics/departments/ technology_art_design/undergraduate/applied_engineering
National University (part of the National University System) Department of AE	www.nu.edu/OurPrograms/SchoolOfEngineeringAndTechnology/ AppliedEngineering.html
North Carolina A&T State University (NC) / School of Technology Department of Applied ET, BS in Applied ET	www.ncat.edu/academics/schools-colleges1/sot/aet/index.html
Bowling Green State University (OH) The College of Tech, Architecture and AE Department of Engineering Technologies, BST (various majors)	www.bgsu.edu/technology-architecture-and-appliedengineering/ departments-and-programs.html
Kent State University (OH) College of Applied Engineering, Sustainability and Technology BS Applied Engineering (several concentrations)	www.kent.edu/caest/undergraduate/index.cfm
California University of Pennsylvania (PA) / Department of AE & Tech	www.calu.edu/academics/colleges/eberly/aet/index.htm
Millersville University (PA) (part of the PA State System) Department of AE, Safety & Tech	www.millersville.edu/aest BS in AETM (Applied Engr. & Tech. Mgmt.)

Technology is:

i. Any *hardware* specific to an engineering discipline
ii. Any *software tool* used in analysis, design, or simulation of engineering systems
iii. Any engineering design *technique, method* or *process* described in a textbook, a patent, or other scholarly publication.

Then by association, a graduate of Engineering Technology has skills in the practical and immediate use of technology to solve engineering problems. More specifically then:

ET graduates focus on using current or emerging technology to solve (applied) engineering problems that industry faces in the short to medium time frame.

The word "applied" is included in parenthesis because although several colleagues have insisted on highlighting that the industry problems solved by ET graduates are applied engineering problems, I personally feel that "applied" can be left out without any negative consequences. Note on the other hand the intentional omission of the hands-on, applications-oriented, and project-based terminologies so typically used by ET program descriptions nationwide, but now also used by many other engineering programs. This perspective on technology and ET captures the tools and methods used; it focuses on solving relevant engineering problems; it gives ET a clear, distinguishing, non-comparative mission; and it highlights industry's need for the 'now' solution. In short, the perspective owns the words engineering and technology; it is effective in dismissing what appears to be a chronic identity crisis, in dispelling misconceptions, in advising students, and in minimizing or hopefully eliminating a source of unnecessary and fruitless angst that permeates our conferences and discussions. It is also a crisp 30-second elevator speech that can be given to technical and more importantly non-technical audiences.

The information contained in Appendix A is offered in the spirit of the ASME's Which Path Will You Take guidelines[5] in order to assist prospective students, counselors, and industry recruiters in better identifying ET as a path to a career in engineering. The information is generic and can be easily inserted in a flier with the university or departmental logos and colors. Again note in particular the intentional omission of direct comparisons with other engineering programs. The message being: this is what ET is and what it does.

ET has been around for many decades, it exists in well over 100 institutions of higher education awarding 6,000+ degrees in 2012, and it has matured to spur graduate programs. There is no need for rebranding; there is a need for coming together as 100+ programs strong and speaking as one voice which will spur growth and national recognition. One definite step forward is the recent draft revision of the US Office of Personnel Management classification and qualifications of engineering positions to include the B.S.E.T. degree. When approved, this will add 6,000+ annual BSET graduates to fill engineering positions in federal agencies. A second step forward is the tagline[6] recently adopted by the ETC leadership that says: "*The degree is Engineering Technology, the career is engineering*."

On Ranking ET Programs: an ETC Action Item

The time is right to once again tackle ways of ranking ET programs. A features table is easily drafted based on the annual ASEE Profiles of Engineering & Technology Colleges for the purpose of establishing national rankings. Some of the metrics are already reported annually to the ASEE by almost 100 institutions; other metrics can be adequately measured and added to the annual profile. Table 2 is a good starting point listing a set of twelve features already collected by the ASEE annual profile. The first seven are tracked for both engineering and ET disciplines, whereas the last five are tracked only for engineering disciplines. Other features that are more specific to ET programs are also included in the table. The list of fourteen features proposed to be tracked for ranking of ET programs are marked with a (✓).

The ETC leadership has the ability to organize a task force from the ET community charged to design a set of relevant features and work with the ASEE in implementing a data collection, tracking and publication process. The availability of national data that is centrally collected by the ASEE will eventually lead to ranking. Ranking discussions may be contentious, but by concentrating on the positive, rankings can also be quite valuable to faculty and administrators seeking to improve and expand their programs.

On Graduate ET Programs: the natural growth direction

The 1980's controversial debate on the need for master's degrees in ET[7,8] was fueled by the perception – still brought up to this day – that ET programs lack the scientific rigor and sophistication of other similar fields, primarily in engineering and science. Over the years, M.S. degrees awarded in Engineering Technology units have been established but as of fall 2012, only the 21 institutions in Table 3 reported to ASEE a total of 1,337 graduate students enrolled, and 499 degrees awarded.

Although the data in Table 3 represent healthy17% and 49% increases from the previous year in enrollment and degrees awarded respectively, it is imperative that graduate ET programs continue to be established and nurtured to strengthen ET's footing in academics and in scholarship. Despite the low statistics compared to other engineering fields, it is expected that more graduate programs will be created in the future because of three main factors[9,10]: (i) the over 100 B.S. programs in ET in the U.S. are mature; (ii) graduate education is in demand; and (iii) the ET faculty profile has changed drastically in the last decade to a majority of individuals holding a Ph.D. and being required to be engaged in research and scholarly work needed to navigate the expectations of tenure and promotion.

The M.S.E.T. stands on equal footing with M.S. programs in any other field, particularly in engineering when viewed from the perspectives of the scientific level of graduate ET courses, the roles that ET graduates perform in the engineering profession, and the philosophy of ET research. Indeed, following the earlier discussion on the definition of technology and description of ET, then the M.S.E.T. graduate has the three distinguishing characteristics listed next.

Table 2 Proposed ET Ranking Features (✓)

	The first 12 features are reported by the ASEE Profiles of Engineering & Engineering Technology Colleges Features 1-7 are currently tracked for Engineering and for ET disciplines Features 8-12 are tracked for Engineering disciplines only	
1	Discipline Categories: Aerospace, Architectural, Civil, Computer, Construction, Electrical, General, Industrial/Manufacturing, Mechanical, Other	✓
2	BS degrees awarded: % by Gender, Ethnicity, Residency (Domestic, Foreign National)	✓
3	BS degrees awarded: by Discipline Category	✓
4	Enrollment UG: % by Gender, Ethnicity, Residency (Domestic, Foreign National)	✓
5	Enrollment UG: by ET Discipline Category	✓
6	Graduate Enrollments: by Institution, FY, Full-Time, Part-Time, Gender	✓
7	Graduate Degrees Awarded: by Institution, Ethnicity, Gender	✓
8	Number of tenured/tenure-track faculty by rank: % by Gender, Ethnicity	✓
9	Number of non-tenure-track personnel (full-time)	✓
10	FTE of all Part-Time Teaching Personnel	✓
11	Externally-Funded Research Expenditures: total; by source (federal, industry, state, private, individual, local, foreign)	✓
12	Ratios: such as: (# of BS awarded) / (# of faculty); (research expenditures) / (doctoral degrees awarded)	
	Other Specific Features to ET	
1	ETAC/ABET accreditation	✓
2	Industry Funding and Donations: highlights the importance of industry relations/support	✓
3	Ratios • (# of BS awarded) / (# of total faculty) • (# of master's awarded) / (# of total faculty) • (research expenditures) / (master's degrees awarded) • (industry funding, donations) / (# of full-time faculty)	✓

Table 3 Graduate ET Enrollments and Degrees Awarded

Source: ASEE 2011, 2012 Edition Profiles of Engineering & Engineering Technology Colleges
8/20 programs report an increase in enrollment from 2011 to 2012; 17% increase overall
7/17 programs report an increase in degrees awarded; 49% increase overall

21 Programs Ordered by 2012 Enrollment	**Master's Enrollment**		**Degrees Awarded**	
	2011	**2012**	**2011**	**2012**
Purdue University - College of Technology (IN)	324	459	80	184
Rochester Institute of Technology - College of Applied Science and Technology (NY)	133	144	37	47
Purdue University, Calumet - School of Technology (IN)	117	112	29	43
Indiana University-Purdue University Indianapolis - Purdue School of Engineering & Technology (IN)	110	109	40	35
University of Tennessee – Chattanooga (TN)	79	90	42	37
Arizona State University at the Polytechnic Campus (AZ)	88	75	32	24
University of North Texas – College of Engineering (TX)	63	70	12	20
University of Houston - College of Technology (TX)	44	48	15	18
Northern Illinois University (IL)	--	38	--	33
University of North Carolina – Charlotte (NC)	14	26	--	--
Middle Tennessee State University (TN)	24	24	6	6
Drexel University, School of Technology (PA)	15	23	--	2
Southern Polytechnic State University - School of Engineering Technology and Management (GA)	26	20	8	11
Oregon Institute of Technology (Various Campuses) (OR)	30	18	6	8
Western Carolina University (NC)	17	17	5	5
Indiana University-Purdue University Fort Wayne - College of Engineering, Technology, and Computer Science (IN)	18	16	5	5
Wayne State University – College of Engineering (MI)	15	14	5	9
The University of Memphis – Herff College of Engineering (TN)	13	13	6	7
Michigan Technological University (MI)	1	11	--	--
Brigham Young University – Fulton College of Engineering & Technology (UT)	8	8	3	3
Montana State University (MT)	4	2	5	2
Totals	**1,143**	**1,337**	**336**	**499**
%	**--**	**+17**	**--**	**+49**

M.S.E.T. Characteristics:

i. The ability to use analytical methods and project management tools in solving engineering problems that improve a process of industrial relevance
ii. The ability to effectively communicate engineering solutions to technical and non-technical audiences
iii. The ability to use advanced technology appropriate to a major field of engineering

Appendix B contains a generic M.S.E.T. degree with thesis, project, and course option plans. The degree program seeks to prepare individuals with advanced technical competencies, capable of engaging in translational research applications. Programs may also offer opportunities for students to develop a basic level of business skills related to project management, business planning, technology forecasting, entrepreneurship, organizational leadership, logistics, communication, and human resources.

Adam Rasheed's Innovation Triangle[11] depicts invention, the value to the customer, and the value to a company as the three main elements of innovation. In turn, these map to create, evaluate and implement as the actionable verbs, claiming that a successful innovation must address all three elements. The NAE similarly refers to innovation as consisting of being first to acquire new knowledge through leading edge research (a call for basic research); being first to apply that knowledge to create sought-after products and services (a call for applied research and manufacturing); and being first to introduce those products and services into the marketplace (a call for entrepreneurship). Clearly, M.S.E.T. graduates develop the skills to fit very well within the calls for applied researchers and for entrepreneurs. Ultimately, ET programs continue to play a critical role in increasing the number of qualified professionals entering the engineering profession.

On National Marketing: an ETC Action Item

A national marketing strategy is well overdue and needed to increase ET awareness in the community, particularly K-12, Community Colleges, and industry. It would be relatively easy and cost-effective for the ETC leadership to periodically solicit and collect pertinent information from ET units throughout the year, and to dedicate a page of the ETD website http://www.engtech.org/ as the central venue to highlight ET industry interactions, student/faculty/alumni success stories, scholarship, and community engagement across the nation. A sturdier and unified image of the value of ET portrayed to prospective students, their school counselors, their parents, industry recruiters, and faculty and administrators can be achieved by widely and continuously publicizing in the national arena. The maintenance cost could be absorbed by a nominal administrative contribution from each participating unit.

Typical information displayed on the ETD website could include

- ET tagline and generic descriptive information to guide the visitor
- Current list of ET programs that report data to the ASEE
- National ET statistics as collected by the ASEE

- Current list of M.S. programs and contact information
- Highlight success stories: 2-to-4 year articulation, patents, nationally competitive funding, alumni accomplishments, student competitions
- Highlight industry/ET interactions
- Significant ET scholarship
- Links to a facebook page and other social media

Conclusions

In response to a revived call for action by the 2013 ETLI, the article provides specific steps to address four coupled issues affecting the national ET community. Any attempts at rebranding ET are wholly unnecessary and destined to fail. Instead, a simple yet effective definition of technology and by association ET are offered to hopefully put to rest the uneasiness that seems to continue to surround the discussion on engineering and ET. The ETC leadership is called to lead efforts to rank ET programs and to use the ETD website as the central venue for marketing ET highlights. Although ranking is a contentious topic, it can also be of great value to units that wish to grow and expand. As a starting point, a features table is drafted based on the annual ASEE Profiles of Engineering & ET Colleges. Finally, the best fuel for ET growth is to invest in its graduate programs. The M.S.E.T. encourages faculty and student research reaffirming ET's stance on academics and scholarship.

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Appendix A: Generic ET Information

What is Engineering Technology (ET)? This is a fairly common question asked by High School and Community College academic advisors, by industry recruiters and by parents, but also by prospective students who are considering a career in engineering, or who are already involved in technology-related work in some capacity but would like to expand their professional horizon.

Undergraduate and graduate ET degree programs are proven paths to successful and rewarding careers in the field of engineering. The Bachelor of Science in ET degrees (BSET) may be ABET-accredited by the ETAC commission; the Master of Science with a major in ET degree (MSET) offers opportunities to expand the technical know-how in a particular engineering discipline, to polish professional skills such as project management and communication, and to contribute to the solution of industry's current engineering problems via applied research and the use of technology.

As students explore the various departments that offer degrees conducive to an engineering career, they may be confused to find programs with similar course names and topics; some degree names are similar; and the advertised career opportunities, job functions, and job titles may also be similar. All engineering and ET programs and courses rely on various levels of math and science, on engineering design principles, and on laboratory proficiencies. Some programs may seek to develop stronger analytical skills and broader levels of abstract design competencies. It is natural that many prospective students wonder which degree path to take, and where their best fit might be along the broad spectrum of professional occupations that engineering has to offer. Depending on the discipline, functional engineering tasks may include industrial equipment installation, maintenance and operation; engineering field work; technology deployment; new technology research and development; technology management; project bidding and scheduling; process improvement; system conceptualization, design and re-design; engineering operations management; industrial training, representation and sales; and many more! *A degree in ET can also set graduates on the way to career choices in business, law or medicine*.

The challenge for a prospective or current student is to rely on their experience, do some "soul searching", and seek advice to help them assess their own skills, abilities, and interests that match the academic expectations of a particular degree plan.

The challenge for industry recruiters is to carefully evaluate the competencies required to perform specific functional engineering tasks and match the right candidate for the right position.

The additional information given below has been adapted from the American Society of Mechanical Engineers (ASME) brochure "Which Path Will You Take", and from Student Outcome criteria of the ET Accreditation Commission of ABET (ETAC).

General Characteristics of BSET Graduates
As far as the 'E' and the 'T' in STEM are concerned, technology is any hardware specific to an engineering discipline; any software tool used in analysis, design, or simulation of engineering systems; and any engineering design technique, method or process described in a textbook, a patent, or other scholarly publication. Then, by association, ET graduates focus on using current or emerging technology to solve engineering problems that industry faces in the short to medium time frame. Graduates focus on the operations, testing, and improvement of engineered systems, processes, and products while incorporating economic principles and considering social, ethical and environmental impacts. Graduates also display an ability to design systems, components, or processes for engineering problems appropriate to the objectives of each program.
Program Fundamentals, Objectives & Emphasis
BSET programs require integral and differential calculus as well as basic science courses to apply analysis techniques and implement solutions for engineering design problems and system prototypes. The emphasis is on applying current knowledge and practices of technology to the solution of industry's short- to medium-term engineering problems while adapting to emerging technology.
Program Length and Transfer Potential
The BSET is a four-year program. Transfer students from community colleges or other institutions may take longer if they do not have the basic math and science courses, or appropriate laboratory proficiencies, or in some programs, if the student does not have the engineering fundamentals that are completed in the freshman and sophomore years. Transfer to another engineering curriculum is possible with some loss of credits and time. Generally, a transfer is best during the first 2 years to avoid delays caused by having to take additional math and engineering prerequisite courses. Conversely, a transfer to a BSET curriculum from another engineering program is possible with some loss of credits and time. Generally, a transfer is best during the first 2 years to avoid delays caused by having to acquire ET laboratory proficiencies.
Typical Courses in ET
ET courses are virtually all connected to the analysis of current engineering design applications and of specific technical examples that illustrate the underlying theory without resorting to the abstract manipulation of mathematics. Labs are an integral component of ET programs, stressing practical design solutions, experimental techniques, and performance evaluations appropriate for industrial type problems. Typically, students begin taking ET major courses during the freshman year.
Occupation Designation
BSET degree graduates are referred to as engineering technologists. A recent study indicates that a majority of companies, large and small, representing a wide spectrum of industries regularly employ

BSET graduates with "engineer" job titles, e.g., "field engineer". Few companies actually use the title of engineering technologist. BSET graduates entering industry would most likely aspire to an entry-level position in product design, development, testing, technical operations, process improvement, field work, or technical services and sales. BSET graduates are prepared to immediately begin technical assignments since ET programs stress current industrial practices and design procedures. BSET graduates may also aspire to move into industrial supervisory positions, and technical or engineering management positions based on individual performance and experience.
Continuing to Graduate School
BSET graduates may consider further study leading to the MS in ET. The MS is typically 30 semester credits with a thesis, or 33-36 semester credits with a project or courses only options; either can be completed in 2 years. BSET graduates may also consider further studies in STEM education, technology management, business, law or medicine. Entrance requirements to the MS or PhD in other engineering programs vary among universities and disciplines; some universities may require BSET/MSET graduates to take several engineering and/or mathematics courses prior to being admitted.
Professional Registration
BSET/MSET graduates may become professionally certified in their specific areas of expertise. Graduates may also take the fundamentals of engineering (FE) exam prior to graduation from college and work for several years to become registered professional engineers (PE) in many states; however, the requirements vary from state to state. Refer to the following site for information: National Society of Professional Engineers (NSPE) http://www.nspe.org/index.html
Accreditation
BSET degrees may be accredited by the Engineering Technology Accreditation Commission (ETAC) of the Accreditation Board for Engineering and Technology (ABET) www.abet.org

Appendix B: Generic MSET Degree Plan

Master of Science in Engineering Technology
Degree Plan: CONCENTRATION AREA (Thesis Option – 30 hours)

BLOCK A - 12 Hours	**SEMESTER / YR**	**COMMENTS**
MSET 1 Seminar in ET (1)		Repeat 3 times*
MSET 2 Design of Experiments (3)		Offered Fall/Spring as needed
MSET 3 Analytical Methods in ET (3)		
MSET 4 ET Project Management (3)		Normally Fall Offering
BLOCK B – Select 12 hours Technical Concentration		Consult with Major Professor on Course Selection
MSET 5		Normally Fall Offerings
MSET 6		
MSET 7		Normally Spring Offerings
MSET 8		
MSET 9		
MSET 10 Studies in ET (3)		These courses (maximum of 2) may be taken with Major Professor and Departmental Approval. Special Topics/Problems Courses Offered in Fall/Spring
MSET 11 Special Problems (3)		
One Course substitution (3)		
BLOCK C - 6 Hours		
MSET 12 Master's Thesis		Major Professor Approval Required

* The Seminar provides opportunities in 3 consecutive semesters to expose students to items not necessarily covered in regular courses such as research directions in the department via faculty presentations and student Thesis/Project defenses; resource usage (e.g., library search engines); specialized research labs and other facilities; engineering ethics and plagiarism; pedagogy lessons; communication practices; and thesis document formatting.

- Project Option (33 hours):
  - Add 6 hours to Block B for a total of 18 hours
  - Replace Block C with a 3-hour Project course. Opportunities for a Project include a specific task from an on-going thesis or funded project; an industry-defined problem; and a laboratory improvement task.

- Course Option (36 hours): particularly appealing to working individuals and programs that have a significant online presence
  - Add 12 hours to Block B for a total of 24 hours
  - Delete Block C