Program Review Report

for the

Industrial Technology

Program

at

Fitchburg State University

160 Pearl Street
Fitchburg MA 01420

June 2020 ***revised***

Dean's Rubric for Program Review

Program: Industrial Technology
Date: May 8, 2020

Rubric Scale:

- Absent: No information is provided, must be completed.
- Developing: Some information is provided, but the description and/or discussion is incomplete, some revisions/additions needed.
- Developed: Information and/or discussion is provided on all key components, no revisions needed.

Executive Summary of Comprehensive Plan for Improvement				
Summary of the self-study findings	**Rating**			**Comments**
	Absent	**Developing**	**Developed**	
		X		
Overview and Vision				
Item	**Absent**	**Developing**	**Developed**	**Comments**
1. Brief overview of the department		X		
2. Program's vision, mission and objectives			X	
3. Relationship to the university mission, vision, and strategic plan and to the university strategic plan (if applicable)			X	
4. Overview of program (including minors, concentrations, and graduate coursework)			X	
5. Internal demand of the program or department				Not Applicable
6. Recommendations and actions from previous program review Departmental/program initiatives and significant changes during the period since the last review.		X		Actions completed by curriculum transformation and AUC proposals
Assessment				
Program Inputs	**Rating**			**Comments**
	Absent	**Developing**	**Developed**	
a. Program reputation			X	
b. Students by program		X		
c. Faculty			X	

d. Staff support			X	
e. Resources		X		
f. Inclusiveness of Trend Data		X		
Program Processes	**Rating**			**Comments**
	Absent	**Developing**	**Developed**	
a. Curriculum			X	AUC Proposals
b. Students			X	
c. Faculty			X	
d. Quality Improvement Initiatives		X		AUC Proposals
e. Inclusiveness of Trend Data		X		
Program Outcomes	**Rating**			**Comments**
	Absent	**Developing**	**Developed**	
a. Program			X	
b. Student			X	
c. Inclusiveness of Trend Data		X		
Analysis and Action Plan for the Future				
	Rating			**Comments**
Action Item	**Absent**	**Developing**	**Developed**	
1. Comparative strengths and distinctiveness, and areas of improvement across all program levels		X		
2. Opportunities to extend existing strengths and resources in place or needed		X		
3. Opportunities for addressing weaknesses		X		
4. Positioning of program to address future direction of the discipline		X		
5. Action Plan for the period until the next review	**Rating**			**Comments**
	Absent	**Developing**	**Developed**	
a. Key objectives, and strategic actions to achieve each objective		X		Program retitled to Engineering Technology
b. Timeline, with milestones and measurable outcomes to determine progress and measure success		X		ETAC of ABET accreditation during 2021-22 cycle
c. Method of achieving objectives		X		ABET accreditation
d. Resources necessary to achieve the plan		X		

General Comments:
ABET accreditation will provide a desired reputation at the national level when seeking external funding from NSF and others as part of the national priority to attract students to science, technology, engineering, and mathematics.

A. Executive Summary of Comprehensive Plan for Improvement

The Industrial Technology Department, now renamed the Engineering Technology Department, supports Fitchburg State University's goal of recruiting and retaining students from traditionally underrepresented groups in higher education. Overall, the department's student profile follows general university trends. For example, those first in their family to attend college compromise (31%), low income (27%), and those who commute (65%). The department supports the university's mission to provide affordable, life-long learning opportunities in undergraduate, graduate, and continuing education. In addition, the university seeks to encourage the development of the whole person, and to prepare the student for careers that meet the needs of their varied communities. To meet these needs, the department provides undergraduate programs in Engineering Technology (previously titled Industrial Technology), Applied Science and Technology (previously titled Technology Education), and continuing education and graduate programs in Occupational Education. As the Industrial Technology Department has evolved over this review period, the Engineering Technology Department and the Engineering Technology Program names will be referenced in this document.

The department and the Engineering Technology Program supports Fitchburg State University's role as an anchor institution within the region in part by supporting the university's partnership in the regional economic development strategy designed to: (a) produce a highly skilled and motivated workforce; (b) expand and diversify the regional economy with job growth in science, engineering, and technology, and; (c) strengthen and expand the district's small businesses. In the northeast, Fitchburg State ranks 51st in the U.S. News Ranking & World Report and first in the Commonwealth of Massachusetts among the regional comprehensive universities for social mobility.

Supporting its programs and to help fill opportunity and achievement gaps in its student base, the department has hosted several career fairs and regularly distributes a student resume book to approximately 900 regional employers promoting student internships and full-time career opportunities upon graduation. The department has expanded its student success initiatives for advising and career support, introduced computer technologies to facilitate high-touch advising, and improved monitoring of academic achievement with data analytical tools including our Student Success Collaboration (SSC) software and the Degreeworks Audit tool.

These student success tools combined with our strong STEM oriented programs have helped increase the region's technical workforce. They have also increased our awareness of the growing opportunity gaps among talented students from low income backgrounds and minority groups that have limited support to access to Science and Technology (S&T) occupations in the overall workforce. For example, Blacks, Hispanics, and American Indians and/or Alaska Natives make up 27% of the U.S. population age 21 and older, but they comprise only 11% of workers in S&T jobs (NSF S&E Indicators, 2018). These disparities exacerbate regional concerns about an aging S&T labor force. The median age of scientists and engineers in the labor force was 43 years in 2015, compared to 41 years in 1995. Similarly, between 1993 and 2015, an increased percentage of scientists and engineers in their 60s reported that they were still in the labor force. Whereas 54% of scientists and engineers between age 60 and 69 were in the labor force in 1993, the comparable percentage rose to 62% in 2015 (NSF S&E Indicators, 2018). Conversations with our regional employers confirm these trends about an aging workforce as the demand for S&T degree holders continue to rise. Overall, the total number of S&T degree holders in the United States grew from 9.6 million to 13.6 million between 2003 and 2015, reflecting a 2.9% annual growth rate (NSF S&E Indicators, 2018).

The department's review of local workforce trends (*The Central MA Regional Workforce Blueprint*, 2018) showed similarities with national norms. When many older and experienced workers do retire, they leave gaps that are proving difficult to fill as younger workers are not choosing to enter S&E fields in numbers sufficient to the need. This is the situation in advance manufacturing where many older workers and job seekers are not familiar with automated manufacturing processes that require knowledge and skills in critical areas of software and programming. The increased use of automation in our region creates greater efficiencies and productivity. However, changes in workforce demands have shifted Massachusetts' economy from among the most equal income distributions in the nation to one of the most unequal. In 2015, the top 10 percent of Massachusetts families garnered more than half the income in the state, up from less than a third in 1970 (Smith, R. & Smith, S., 2019). These disparities in income are increasing every year which create a need to recruit a highly skilled workforce for a sustainable economy of Massachusetts (Massachusetts BHE Report, 2019).

Students in the Engineering Technology Program learn many of the engineering concepts and skills that are necessary for successful engineering careers and practice emphasizing emerging trends in electronic sciences and internet-of-things. This undertaking, among others, is a significant component of the University's commitment to science, engineering and technology, and of major importance to the region as it helps close the applied technology skills gap by producing more technically trained people in industry (that would not be satisfied by the newly minted engineers coming out of science-based engineering programs). According to the Department of Education's Integrated Postsecondary Education Data System (IPEDS), in 2014 there were 17,915 graduates of 4-year (bachelor's degree) and 34,638 graduates of 2-year (associate's degree) engineering technology programs. Wentworth Institute of Technology and Keene State College awarded 207 and 139 4-year degrees. The U.S. Department of Labor's Bureau of Statistics (BLS) reports that one of the top 10 best paying jobs for individuals is a degree in Engineering Technology, with positive job growth at 5% expected through 2018.

To help meet these growing trends and to work toward national accreditation guidelines, the department evaluated its past curriculum and developed the following AUC proposals that were submitted and approved to transform our day program curricula including the changing the Industrial Technology Program to the Engineering Technology Program:

AUC 2019 #69 approved to transform the Industrial Technology Program to the Engineering Technology Program, AUC 2019 #62 approved to transform the Architecture Concentration from

Industrial Technology to Engineering Technology. AUC #63 2019 approved to transform the Electronics Concentration from Industrial Technology to Engineering Technology. AUC #64 2019 approved to transform the Energy Management Concentration from Industrial Technology to Engineering Technology. AUC 2019 #65 approved to transform the Manufacturing Concentration from Industrial Technology to Engineering Technology.

Following course proposals were submitted and approved to support AUC 2019 #69, 62, 63, 64 and 65; AUC 2018 #s 18, 19, 20, 21, 22, 23, 24, 25, 26, 28, 30, 31, 32, 33, 34, 35 , 36, 37, 38, 41; and AUC 2019 #s 23, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 42, 44, 45.

B. Overview and Vision

Brief overview of the program.

The origins of the Industrial Technology program at Fitchburg State University can be traced to the "Fitchburg Plan of Co-operative Industrial Education" that enrolled the first cohort of 34 students in 1908. Since then, several name changes, improvements and additions over the years have taken place. As of February 2019, students admitted to the Engineering Technology Program will receive a strong core of engineering technology courses and can further select from several concentrations electives that further strengthen the program's graduates' preparedness for careers in the following essential fields: Architecture, Electronics Engineering Technology, Energy Management Engineering Technology, and Manufacturing Engineering Technology.

C. Program's vision, mission and objectives

C.1 Fitchburg State University Mission Statement

Fitchburg State University is committed to excellence in teaching and learning and blends liberal arts and sciences and professional programs within a small university environment.

Our comprehensive public university prepares students to lead, serve, and succeed by fostering lifelong learning and civic and global responsibility. A Fitchburg State education extends beyond our classrooms to include residential, professional, and co-curricular opportunities. As a community resource, we provide leadership and support for the economic, environmental, social, and cultural needs of North Central Massachusetts and the Commonwealth.

C.2 School Mission

The Mission of the School of Business & Technology is to provide quality undergraduate and graduate education in business, engineering technology, applied science and technology, and computer science; and to produce graduates who are well prepared to practice in their field of study and/or to pursue advanced education.

C.3 Department of Engineering Technology Mission

The Department of Engineering Technology has the mission of specifically promoting and sustaining Bachelor of Science degree programs which meet the needs of industry and society, particularly, in central/south-side Massachusetts. The Engineering Technology program prepares graduates who can respond aggressively to the changing needs at the local, national and global levels by applying research and theory in the development of sustainable efficient systems and processes. We are committed to providing a quality education that focuses on life-long learning experiences to meet the needs of a rapidly changing work environment in north central Massachusetts and elsewhere. This preparation is enhanced through extensive class-room study and hands-on laboratory experiences.

C.4. Engineering Technology Program Mission

The Engineering Technology Program’s mission is to prepare its graduates with the following:

(1) an ability to apply knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve broadly-defined engineering problems appropriate to the discipline;

(2) an ability to design systems, components, or processes meeting specified needs for broadly-defined engineering problems appropriate to the discipline;

(3) an ability to apply written, oral, and graphical communication in broadly-defined technical and non-technical environments; and an ability to identify and use appropriate technical literature;

(4) an ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes; and

(5) an ability to function effectively as a member as well as a leader on technical teams.

C.5 Relationship to the university mission, vision, and strategic plan (if applicable)

The program’s mission reflects the demand for a regional workforce with more technology degree holders than currently available. The BHE’s report made the assertion that by 2025, Massachusetts’ public higher education system will fall short of meeting the state’s need for new associates and bachelor’s degrees by a minimum of 55,000 to 65,000. These statistics show that there is a huge demand for a skilled workforce which can be achieved by improving the college enrollment and graduation rates for the state's national leadership in technological innovation and economic progress.

D. Overview of Curriculum

D.1 The degree requirements for the Engineering Technology program core courses are as follows:

1. ENGT 1000 Electrical Systems and Circuits 3 cr.
2. ENGT 1020 Engineering Graphics 3 cr.
3. ENGT 1050 Technical Analysis 3 cr.
4. ENGT 1040 Software Applications in Engineering Technology 3 cr.
5. ENGT 2000 Fluid Mechanics & Thermodynamics 3 cr.
6. ENGT 2020 Statics and Dynamics 3 cr.
7. ENGT 2025 Strength of Materials 3 cr.
8. ENGT 2030 Material Testing & Quality Control 3 cr.
9. ENGT 3000 Energy & Sustainable Practices 3 cr.
10. ENGT 3025 Engineering Design: Fabrication Sys. I 3 cr.
11. ENGT 3026 Engineering Design: Fabrication Sys. II 3 cr.
12. CMGT 3030 MEP & HVAC Systems 3 cr.
13. CMGT 3035 OSHA: Safety & Risk Management 3 cr.
14. ENGT 4700 Engineering Project Management 3 cr.
15. ENGT 4093 Engineering Technology Capstone 3 cr.

D.2 The Industrial Technology Designated Liberal Arts and Science Courses are as follows:

1. MATH 1300 Precalculus 4 cr.
2. CHEM 1300 General Chemistry I 4 cr.
3. MATH 2100 Technical Calculus 3 cr.
4. ENGT 1700 Evolution of Engineering Technology 3 cr.
5. PHYS 2300 General Physics I 4 cr.
6. PHYS 2400 General Physics II 4 cr.
7. ECON 1100 Principles of Economics-Macro 3 cr.

D.3 Concentrations as grouped elective courses

a) The Architecture Concentration is a pre-professional course of study that provides a foundation of architectural and engineering technology undergraduate studies. It is based on a strong core in technology and how this important knowledge base applies to successful building and architectural design.

b) The Electronics Engineering Technology Concentration prepares students for positions in the field of electronics by developing the theoretical and practical skills required for this discipline.

c) The Manufacturing Engineering Technology Concentration enhances the knowledge and skills required of positions in manufacturing. This program provides a practical knowledge of manufacturing processes and the ability to apply the processes for production.

d) The Energy Management Engineering Technology Concentration provides students with a general base of HVAC, building utilities and energy. The concentration is aimed to find rewarding and challenging careers in this fast growing field.

D.4 Discipline specific best practices

The Engineering Technology Program follows current ABET (Accreditation Board of Engineering and Technology) guidelines (Criterion 1-5) for accreditation. As an example, criterion 1 requires a comprehensive program for advising and monitoring students. The department utilizes the campus-wide database (Degreeworks a student successful platform) to track each student's progress through the program requirements. Students can access Web4 reports themselves, but the reports are also used during meetings with their assigned department advisors each semester. Students are required to meet with their advisors before they can register for the following term. This is enforced with a 'registration pin', unique to each student and each semester, which they need to register on-line, or by the advisor's signature on a paper registration form. The registration process through this database enforces prerequisites and will only allow students to register for a course if the prerequisite is met or in-progress. The instructor can waive a prerequisite when circumstances warrant it. Under special circumstances, only the department chair can waive program requirements.

The Engineering Technology Program outcomes, mapping of outcomes to courses, and related use of indirect and direct measures to assess student achievement are aligned with ABET's criterion 2 and 3 respectively.

D.5 Explain the balance between breadth and depth designed in the program

The Engineering Technology Program objectives are achieved through a 120 hour curriculum that strikes a balance between analysis and design. The four-year curriculum provides: (a) technical depth related to the various elements of the design process; (b) oral and written communication including six hours of ENGL 1100 Writing I and ENGL 1200 Writing II; teamwork in courses using cooperative learning paradigm that builds on an assertion that learning is an active process of discovering, constructing, and integrating new knowledge; (c) laboratory experience as a fundamental component of the engineering technology curriculum; (d) and computer experiences requiring students to be proficient in computer programming and use of relevant engineering software including Solid Works.

D.6 Internal demand of the program or department:

The Department is reviewing its current LA&S approved course ENGT 1700 (Evolution of Engineering Technology) as a university-wide "First Year Experience (FYE)" course.

a. Service courses

   ENGT 1700 "Evolution of Engineering Technology

b. Enrollments in service courses

   This course is an "introductory" level survey course for the beginning students in Business, Technology, and Computer Sciences. It introduces the board topic of technology and examines its implications upon society. Enrollment in the course is expected to grow beyond Engineering Technology majors to include Business, Computer Science, and Computer Information Systems majors. The course also reviews the ways in which technology develops, the processes through which it expands the materials and/or tools needed to sustain, the social and political problems encountered, and future alternatives.

   The course will incorporate a systematic reference to significance within technology and then apply those as a lens with which to analyze and discuss modern and recent findings. Legislative, national, global and other current events will provide tangible occurrences for review and impact analysis. The student is introduced to the career options available to her/him within the curriculum of the Engineering Technology Department: Technology/Engineering Education, Energy Management Engineering Technology, Architecture, Construction Management, Manufacturing Engineering Technology and Electronics Engineering Technology. As a FYE course, it will also overlay an introduction to building academic skills and mindsets preparing students to become effective self-advocates in their new college setting.

D.7 Recommendations and actions from previous five year review

a. Review and update both day programs in the Industrial Technology Department - the Industrial Technology Program and the Technology Education Program.

b. Coordinate with sister programs and submit proposals to update ENGT 1700 to meet the FYE requirements.

D.8 Departmental/program initiatives and significant changes during the five years since the last review.

Major upgrades and changes have occurred since our last review period. These included a major self-study of the Industrial Technology Program and changes in Technology Education Program accreditation and teacher licensure requirements in Massachusetts. The Industrial Technology Program had evolved over time without a clear written mission or detailed standards for student outcomes. The department's curriculum committee augmented by the finding of our self-study began a process of reevaluation and building an updated curriculum paralleling standards developed by ABET (ETAC), the highly regarded education accreditation organization with a focus on engineering and technology. The curriculum committee and the department, with backing from Academic Affairs, proposed the program transition from Industrial Technology to the Engineering Technology discipline as a best representation of the regional needs including concentrations in Architecture, Electronics Engineering Technology, Energy Management Engineering Technology, and Manufacturing Engineering Technology.

The Technology Education Program changes during this time period focused on grades 5-12 educators being scholars in their discipline first and overlaying this with a minor or concentration in education pedagogy. In parallel, and with guidance from the School of Education and Academic Affairs, the Technology Education Program evolved into the Applied Science and Technology Program now with concentrations in Technology/Engineering Education - Licensure Track, Technology/Engineering Education - Non-licensure Track (a new career concentration focus in industry training), and Construction Management (previously as the Construction Technology Concentration in Industrial Technology Program). By moving the Tech Ed degree program to a concentration or minor, it allowed the department to develop this new (replacement) program - Applied Science and Technology. As with Engineering Technology, this new program also focuses on technology but less so in engineering theory, and more toward a focus on managing and applying science and technology. This new program, Applied Science and Technology, is also designed to follow ABET Applied and Natural Science (ANSAC) accreditation guidelines.

Aligned with its program changes, the department was renamed the Engineering Technology Department. See the department's reorganization charted below:

Previous **INDUSTRIAL TECHNOLOGY DEPARTMENT**	
BS in **Industrial Technology**	**BSE** in **Technology Education**
Concentrations: · **Architectural Technology** · **Construction Technology** · **Electronics Engineering Technology** · **Energy Management Technology** · **Manufacturing Engineering Technology**	**5-12 Licensure Track**

New **ENGINEERING TECHNOLOGY DEPARTMENT**	
BS in **Engineering Technology**	**BS** in **Applied Science & Technology**
Concentrations: · **Architecture** · **Electronics Engineering Technology** · **Energy Management Engineering Technology** · **Manufacturing Engineering Technology**	***Concentrations:*** · **Construction Management** · **Technology/Engineering Education - Licensure Track** · **Technology/Engineering Education - Non-Licensure Track**

E. Assessment

E.1 Program reputation

The Engineering Technology program focuses on practical applications of methods, materials, machinery and personnel to support engineering activity. Mechanics and Thermodynamics form the core of the program. Mechanics examines the forces acting on machines and their tendency to cause failure. Thermodynamics covers energy conversion principles as applied to engines, refrigeration, and other systems.

Engineering Technology graduates provide expertise to utilize engineering design into products and services. Graduates engage in problem-solving activity by applying engineering knowledge and skills.

Laboratory experiences in the program include electronics, mechanical measurements, computer aided design, materials testing, and hydraulic and pneumatic systems.

Students apply programming skills in automation, modeling /simulation of engineering systems and the use of Enterprise Resource Planning (ERP) software. Overall, the program provides students with a practical approach to problem solving in areas such as machine design, manufacturing, and production.

Graduates from the program utilize effective communication techniques and are key members of multidisciplinary professional teams. They engage in life-long learning activities as employees of corporations and some attend graduate school.

E.2 Curriculum Mapping of Engineering Technology courses to critical workforce skills

Course Number	Course Title	(a)[1]	(b)[2]	(c)[3]	(d)[4]	(e)[5]	(f)[6]	(g)[7]
ENGT 1000	Electrical Systems and Circuits	X			X		X	
ENGT 1020	Engineering Graphics	X		X				
ENGT 1040	Software Applications in Engineering Technology	X					X	
ENGT 1050	Technical Analysis	X		X				
ENGT 1700	Evolution of Engineering Technology						X	X
ENGT 2000	Fluid Mechanics and Thermodynamics	X			X			
ENGT 2020	Statics & Dynamics	X						
ENGT 2025	Strength of Materials	X	X					
ENGT 2030	Materials Testing and Quality Control	X			X			
ENGT 3000	Energy & Sustainable Practice		X		X			
ENGT 3025	Engineering Design & Fabrication Systems I		X			X		
ENGT 3026	Engineering Design & Fabrication Systems II		X			X		X
CMGT 3030	MEP & HVAC Systems		X		X			
CMGT 3035	OSHA Safety & Risk Management						X	X
ENGT 4700	Engineering Project Management			X		X		
ENGT 4903	Engineering Technology Capstone		X	X		X	X	X

[1] Knowledge, techniques, skills of modern tools of math, science and engineering
[2] Design solutions for well-defined technical problems
[3] Apply written, oral, and graphical communication
[4] Conduct standard tests, measurements, and experiments and to analyze and interpret the results
[5] Teamwork
[6] Professional, ethical and societal responsibilities
[7] Commitment to quality, timeliness, and continuous improvement

E.3 Students by program - New student enrollment trends

	AY 13	AY 14	AY 15	AY 16	AY 17[1]
Total Enrollment in Industrial Technology classes	1,212	1,085	1,015	1,119	1,094
Total Enrollment in All Classes	32,683	33,952	34,081	34,062	34,169
Percentage of total enrollment: Industrial Technology classes	3.71%	3.20%	2.98%	3.29%	3.20%
Number of incoming freshmen majors	41	44	21	37	33
Percentage of incoming freshmen class[4]	5.89%	5.75%	3.08%	5.08%	4.58%
Number of incoming transfer majors	11	19	21	17	15
Percentage of incoming transfer class[4]	2.78%	4.38%	5.01%	4.31%	3.39%

E 3.1 Minimum qualification students must have in the program

As a Massachusetts State University, the minimum requirements for admission to Fitchburg State are set by the Commonwealth's Department of Higher Education.

High School Classes:

English	4 courses
Mathematics	4 courses (Algebra I & II and Geometry or Trigonometry, or comparable coursework) including mathematics during the final year of high school.
Sciences	3 courses (drawn from Natural Science and/or Physical Science and/or Technology/Engineering, and all three must include laboratory work); Technology/Engineering courses must be designated as science courses (taken for science credit) by the high school.
Social Sciences	2 courses (including 1 course in U.S. History)
Foreign Languages	2 courses (in a single language)
	Note: American Sign Language (ASL) is a foreign language.
Electives	2 courses (from the above subjects or from the Arts & Humanities or Computer Sciences)

SAT scores and High School GPA

Recalculated High School GPA	Combined SAT ERW & M and/or ACT Must Equal or Exceed (ACT composite equivalent in parenthesis)
2.51 - 2.99	990 (19)
2.41 - 2.50	1030 (20)
2.31 - 2.40	1070 (21)
2.21 - 2.30	1110 (22)
2.11 - 2.20	1140 (23)
2.00 - 2.10	1180 (24)

E.4 Faculty

The background of the department faculty addresses the needs of the Engineering Technology Major, which provides pathways to diverse fields that call for hands-on engineering competencies. The terminal degrees of the faculty represent Civil, Mechanical and Electrical Engineering disciplines in Engineering, and most have significant teaching and work experience.

E4.1 Faculty Workload

Currently, the Engineering Technology (ET) program has 8 tenured and tenure-track faculty (full-time). As the resumes in Appendix B indicate, six members of the ET faculty have PhDs and teach a variety of courses in the curriculum. The Engineering Technology faculty members are all active in teaching, research and service. The data in Table E1 summarizes the courses taught by faculty in the last 2 years. Faculty members are expected to balance their efforts in teaching and research and maintain a service workload proportionate with program needs.

E4.2 Faculty Size

The program has 6 tenured faculty members, 3 full professors, 3 associate professors, and 2 assistant professors. By virtue of their research or industrial experience, the faculty members have qualifications in multiple areas and are able to teach all courses. The number of Engineering Technology faculty is adequate for the faculty to maintain close contact with the students. All of the members of the faculty are active in student advising and mentoring.

E4.3 Professional Development

In an effort to promote faculty development, the University established the Center for Teaching and Learning (CTL) to ensure that financial resources, facilities, equipment and IT resources would be available to help faculty. Faculty development is a central objective in the University's Strategic Plan. The CTL is funded annually from Fitchburg State University's budget. Development funds for Technology, Computer Sciences, and Math degree programs are coordinated by the Center Director, who organizes many of the faculty development activities. Additionally, Academy workshops on the use of inquiry based learning techniques are planned in order to give faculty additional guidance on using these pedagogical strategies in the classroom and during student peer-mentoring.

E4.4 Authority and Responsibility of Faculty

Faculty members relate well to students and serve as advisors for the student organizations. All faculty members are readily accessible to students. All of them regularly exceed the minimum required number of six office hours per week mandated by the MSCA contract. Communication with the administration usually takes place through the Program Coordinator, the Department Chair and the Dean of Business and Technology in several meetings per semester. In addition, there are numerous faculty/administrator committees that meet regularly. The Engineering Technology faculty meet regularly to discuss any pertinent issues or concerns or to disseminate information. The processes for the evaluation, assessment, and continuing improvement of the Engineering Technology program, including its educational objectives and student outcomes are controlled primarily by the program faculty members.

Table E-1. Course and Section Size Summary

Engineering Technology

Course	Course Title	Lecture	Laboratory	Maximum size
ENGT 1000	Electrical Sys & Circuits	50	50	16
ENGT 1020	Engineering Graphics	50	50	20
ENGT 1040	Software Applications in Engineering Technology	100		20
ENGT 1050	Technical Analysis	100		20
ENGT 1700	Evolution of Engineering Technology	100		20
ENGT 2000	Fluid Mechanics and Thermodynamics	100		20
ENGT 2020	Statics & Dynamics	100		20
ENGT 2025	Strength of Materials	100		20
ENGT 2030	Materials Testing and Quality Control	20	80	20
ENGT 3000	Energy & Sustainable Practice	100		20
ENGT 3025	Engineering Design & Fabrication Systems I	20	80	20
ENGT 3026	Engineering Design & Fabrication Systems II	20	80	20
CMGT 3030	MEP & HVAC Systems	20	80	20
CMGT 3035	OSHA Safety & Risk Management	100		20
ENGT 4700	Engineering Project Management	80	20	20
ENGT 4093	Engineering Technology Capstone	0	100	20

Enter the appropriate percent for each type of class for each course (e.g., 75% lecture, 25% laboratory).

E.5 Staff support

Fitchburg State University has a long and solid history of strength in undergraduate education, which will continue to be emphasized as a hallmark of the Institution by the current administration. Sufficient funds have been provided for support of student workers, program staff, facilities, and equipment.

The Department of Engineering Technology has excellent support personnel. A full-time administrative assistant (and three part-time undergraduate staff) effectively support the faculty and the programs. The Dean's Office provides support with full-time technician, Ms. Robyn Mayo. The team provides support for all of the machining, welding, electronics and energy technology laboratories within the Department. The support involves equipment repair and maintenance, purchases, and vendor support including equipment set-up and training. All equipment is maintained by one of the support technicians. Based on faculty and support technician recommendation, equipment is upgraded or replaced using annual budgeted funds and, when available, special projects funding.

The Department works closely with the Office of Technology Services to ensure the availability of basic software for Technology students in all open laboratories around the campus.

Faculty Qualifications: Engineering Technology

Faculty Name	Highest Degree Earned- Field and Year	RDank [1]	Type of Academic Appointment[2] T, TT, NTT	FT or PT[3]	Years of Experience			Professional Registration/ Certification	Level of Activity[4] H, M, or L		
					Govt./ Ind. Practice	Teaching	This Institution		Prof. Organizations	Prof. Dev.	Consulting/ Summer work in industry
James Alicata	EdD, Occupational Education, 2002	P	T	FT	14	32	21		H	M	M
Soumi Basu	PhD, Mechanical Engineering, 1997	ASC	T	FT	10	23	6		H	H	L
D. Keith Chenot	MFA Vis Arts 2006 BArch 1966	P	T	FT	35	18	18	RA	H	M	L
Sanjay Kaul	PhD, Energy Engineering, 1988	P	T	FT		30			M	M	L
Nirajan Mani	PhD, Const. Engineering, 2015	AST	TT	FT	9	9	5		M	M	L
Abdel Mustafa	PhD, Engineering, 2013	ASC	T	FT	8		6		M	M	L
Wayne Whitfield	PhD, Education, 1999	P	T	FT		35	15		M	M	L
Hong Yu	PhD Electrical Engineering, 2008	AST	TT	FT	10	22	3		H	H	L

Instructions: Complete table for each member of the faculty in the program. Add additional rows or use additional sheets if necessary. Updated information is to be provided at the time of the visit.

1. Code: P = Professor ASC = Associate Professor AST = Assistant Professor I = Instructor A = Adjunct O = Other

2. Code: T = Tenured TT = Tenure Track NTT = Non Tenure Track

3. Code: FT = Full-time PT = Part-time Appointment at the institution.

4. The level of activity (high, medium or low) should reflect an average over the year prior to the visit plus the two previous years.

Faculty Workload Summary

Engineering Technology

Faculty Member (name)	PT or FT[1]	Classes Taught (Course No./Credit Hrs.) Term and Year[2]	Program Activity Distribution[3]			% of Time Devoted to the Program[5]
			Teaching	Research or Scholarship	Other[4]	
James Alicata	FT		50%		50%	50%
Soumi Basu	FT		75%	5%	20%	100%
D. Keith Chenot	FT		75%	5%	20%	100%
Sanjay Kaul	FT		45%	5%	50%	100%
Nirajan Mani	FT		75%	5%	20%	100%
Abdel Mustafa	FT		75%	5%	20%	100%
Wayne Whitfield	FT		50%	5%	45%	100%
Hong Yu	FT		75%	5%	20%	100%

1. FT = Full-Time Faculty or PT = Part-Time Faculty, at the institution
2. For the academic year for which the self-study is being prepared.
3. Program activity distribution should be in percent of effort in the program and should total 100%.
4. Indicate sabbatical leave, etc., under "Other."

Out of the total time employed at the institution.

Demographic Faculty Summary	**No. of Full Time Assigned to Unit**	**No. of Part Time Assigned to Unit**
Women	0	1
Men	8	2
Ethnicity		
White/Caucasian	3	3
Asian	4	0
Hispanic/Latino	0	0
Black/African American	1	0
American Indian	0	0
International or Other	0	0
Credentials – highest degree held		
Bachelor’s Degree	0	0
Master’s Degree	1	3
Doctorate	7	0
Experience		
0-3 years	0	2
4-7 years	4	
8-11 years	0	
12-15 years	0	
16-24 years	2	
25+ years	2	1

E.6 Resources

E6.1 Budget Process

Fitchburg State University is funded by the Commonwealth of Massachusetts. In the spring of each year, the department participates in a budget allocation process. Each program within the department makes requests about its needs to the Chair who then submits it to the Dean of the Division of Business & Technology for review followed by joint approvals by the Executive Cabinet consisting of the Vice Presidents.

E6.2 Sources of Financial Support

The primary financial resource for the department operations is state funds provided by the University's Education and General (E&G) Fund. The base E&G budget includes faculty and staff salaries, and allocations for specific categories such as equipment, travel, teaching and research assistants, and non-personnel services.

The budget process is guided and informed by the priorities outlined in the department's assessment report and strategic plan. While all recurring line items are reviewed, the budget process primarily provides incremental adjustments for new initiatives identified as a result of ongoing assessment or unexpected staff changes.

E6.3 Adequacy of the Budget

Fitchburg State University supports the Department of Technology by providing an adequate budget allocated to the department every year.

E6.4 Adequacy of Equipment

The department currently has adequate facilities to support the engineering technology program. As part of the retitling and preparation for ETAC of ABET accreditation, we anticipate expanding our laboratory facilities with a new materials engineering laboratory and an advanced machining laboratory.

E6.5 Adequacy of Personnel and Institutional Services

The department is very fortunate to have a full-time technician (Ms. Robyn Mayo) supporting the department. Ms. Mayo looks after all of the mechanical, electronic and computer needs of the various programs within the department. These needs include the repair, new equipment set-up and check out, as well as defining equipment in conjunction with faculty.

E6.6 Support for Faculty Professional Development

In an effort to promote faculty development, the University established the Center for Teaching and Learning Academy to ensure that financial resources, facilities, equipment and IT resources would be available to help faculty.

F. Program Processes

F.1 Curriculum requirements

Engineering Technology students are given a broad education in elements of engineering analysis and design to prepare them for successful careers in design and technical services. The engineering technology program objectives are achieved through a 120 hour curriculum that strikes a balance between analysis and design. The four year curriculum is summarized in Table F-I. A course and section summary for industrial technology is shown in Table F-1.

Technical Depth and Expertise
Engineering Technology students develop skills for the various elements of the design process throughout the curriculum, culminating in a capstone course during the senior year. Inspection of Table 5.1 shows that 72 credit hours in the engineering technology program involve engineering technology content.

Oral and Written Communication
Engineering Technology students are required to take six hours of ENGL 1100 and ENGL 1200. Additional written, graphic, and oral communication is incorporated program coursework.

Teamwork in courses and Projects
The ability to work in teams is a program outcome; therefore we use a cooperative learning paradigm that builds on an assertion that learning is an active process of discovering, constructing, and integrating new knowledge. Along with teamwork, our goal is to help students develop experiences based on active learning where they add new experiences to old ones. In this sense, the new experience is networked into a web of previously understood facts. The end result is to require students to work in teams to perform experiments and to analyze experimental results as a cooperative learning experience.

Laboratory Experience
A comprehensive laboratory experience is a fundamental component of the engineering technology curriculum at Fitchburg State University. In line with the current trends in engineering technology practice, the students are involved in computer-based as well as physical experimental work related to both the basic sciences and engineering technology topics. All courses listed below have a hands-on laboratory component. The list includes the approximate credit hours devoted to laboratory experience in each course.

Computer Experience

The engineering technology program requires its students to be proficient in technical software and in the use of selected engineering software including Solid Works.

Table F-1

Course (Department, Number, Title) List all courses in the program by term starting with first term of first year and ending with the last term of the final year.		Course is R,E, or SE[1]	*Curricular Area (Credit Hours)* Math & Basic Science	Discipline Specific Topics	General Ed.	Other	Last Two Terms the Course was Offered:	Max Section Enroll for the Last Two Terms
1: Fall	ENGT 1000, Electrical Sys & Circuits*	R		3			fall 2019 - sp 2020	
	ENGT1700, Evolution of Engr. Technology*	R		3			fall 2019 - sp 2020	
	ENGL 1100, Writing I	R			3		fall 2019 - sp 2020	
	MATH 1300, Pre-Calculus	R	4				fall 2019 - sp 2020	
	GE HIST (LA&S)	SE			3		fall 2019 - sp 2020	
1: Spr	MATH 2100, Technical Calculus	R	3				sp 2020	
	ENGL1200, Writing II	R			3		fall 2019 - sp 2020	
	General Chemistry	R	4				fall 2019 - sp 2020	--
	ENGT1020 Engineering Graphics*	R		3			sp 2020	
	ENGT 1050 Technical Analysis	R		4			fall 2019 - sp 2020	
2: Fall	ENGT Elective	SE		3			fall 2019	
	ENGT 2000 Fluid Mechanics & Thermodynamics	R		3			new	16
	ENGT 1040 Software Applications in ET*	R		3			fall 2019	--
	ENGT 2020 Statics & Dynamics*	R		3			fall 2019 - sp 2020	
	PHYS 2300, General Physics I	R	4				fall 2019 - sp 2020	
2: Spr	LA&S Elective	R			3		fall 2019 - sp 2020	

	ENGT 2025 Strength of Materials*	R		3			sp 2020	
	PHYS2400, General Physics II w/ Lab	R	4				fall 2019 - sp 2020	
	ENGT2030 Materials Testing & Quality Control*	R		3			fall 2019 - sp 2020	
3: Fall	ENGT 3000 Energy & Sustainable Practices*	R		3			fall 2019	
	ENGT 3025 Engineering Design and Fabrication I*	R		3			fall 2019 - sp 2020	
	ENGT Elective*	SE		3			fall 2019	
	ENGT Elective*	SE		3			fall 2019	
	LA&S (ART)	R			3		fall 2019 - sp 2020	
3: Spr	Literature Elective (LA & S)	R			3		fall 2019 - sp 2020	--
	ENGT3026 Engineering Design and Fabrication II*	R		3			fall 2019 - sp 2020	
	LA&S Elective	R			3		fall 2019 - sp 2020	
	ECON 1100 Principles of Econ - Macro	R			3		fall 2019 - sp 2020	
	ENGT Elective*	SE		3			sp 2020	
4: Fall	ENGT Elective*	SE		4			fall 2019	
	CMGT 3030 MEP & HVAC Systems*	R		3			fall 2019 -	
	ENGT 4700 Engineering Project Management	R		3			new	
	CMGT 3035 OSHA: Safety & Risk Mgmt	R		3			fall 2019 - sp 2020--	--
	ENGT Elective*	R		3			fall 2019 - sp 2020	
4: Spr	EXSS 1000 Health & Fitness	R			3		fall 2019 - sp 2020	
	LA&S Elective	E			3		fall 2019 - sp 2020	
	ENGT Elective*	R		3			fall 2019 - sp 2020	
	ENGT 4903 Engineering Tech Capstone	R		3			new	
TOATALS			19	71	30	-		
TOTALS-ABET BASIC-LEVEL REQUIREMENTS			19	38	-	-		

OVERALL TOTAL CREDIT HOURS FOR COMPLETION OF THE PROGRAM	120						
PERCENT OF TOTAL		16	59	25	-		

*Represents new course similar to an existing course.

F.2 Students-

• Learning expectations and learning supports
• Retention initiatives

The department provides opportunities for the *Career Services and Advising center*, and the *Office of Academic Coaching and Tutor Services*. Students will be encouraged to explore co-curricular and service activities through various student clubs and professional student chapters (such as AGC-MA, NAHB, AIAS, IEEE) which help to build their leadership skills and build a professional network. In addition to class activities, faculty advisors are always in communication with students through the *Student Success Collaborative (SSC)* platform. They monitor students' academic progress and inform students about upcoming activities (such as presentations by guest speakers from industry experts, career fair, students' project competition, and site visits) through this SSC platform. In addition to the "Handshake" platform utilized by the Career Services and Advising center to assist students in searching for jobs and internships, the Engineering Technology Department shares the available job and internship opportunities with students through email and the *SSC* platform.

F.3 Faculty Outcomes Responsibilities

See Table F-2

Table F-2. Student Outcome Coordinators

Faculty Coordinator	**(1) knowledge , techniques, skills of modern tools of math, science and engr**	**(2) design solutions for well-defined technical problems**	**(3) apply written, oral, and graphical communication**	**(4) conduct standard tests, measurements, and experiments and to analyze and interpret the results**	**(5) Teamwork**	**(6) Professional, ethical and societal responsibilities**	**(7) commitment to quality, timeliness, and continuous improvement .**
Soumi Basu			X	X			
Abdel Mustafa	X	X					
D. Keith Chenot					X	X	
Sanjay Kaul	X						X
Hong Yu		X		X			
Nirajan Mani					X		X

The direct measure of assessment is apparent through course evaluation of student work in selected courses by the faculty using Performance Indicators (PI).

Table F-3. Courses Used for Assessment of Student Outcomes

Course Number	Course Title	(1) knowledge , techniques, skills of modern tools of math, science and engr	(2) design solutions for well-defined technical problems	(3) apply written, oral, and graphical communication	(4) conduct standard tests, measurements, and experiments and to analyze and interpret the results	(5) Teamwork	(6) Professional, ethical and societal responsibilities	(7) commitment to quality, timeliness, and continuous improvement.
ENGT 1700	Evolution of Engr. Tech.	**X**	**X**					
ENGT 2020	Statics & Dynamics			**X**	**X**			
ENGT 3035	OSHA: Safety & Risk Mgmt					**X**	**X**	**X**
ENGT 4903	Engineering Tech Capstone	**X**	**X**	**X**	**X**	**X**	**X**	**X**

An attempt has been made to use more than one course for the assessment of each outcome and a continuing process for successive semesters with continuous improvement has been established.

Since faculty assessment of student course work is an integral part of the student outcome assessment, the specific courses used for each outcome are listed in Table F3.

F3.2 Advising responsibilities
Each full-time faculty member is required to schedule three hours weekly to meet with students for both academic and course advising. During these meetings students can receive additional

one-on-one instruction outside of the classroom. Each student in the major is assigned an advisor from the department faculty. Each advisor has both Engineering Technology and Applied Science and Technology majors as advisees. All the faculty members are familiar with the graduation requirements for both majors. In addition, they use web4 (a campus-wide academic database) for reports of graduation readiness and the department has prepared a 4-year plan of study and a checklist for each major to assist advisors in determining whether students are on track.

Additional office hours are set aside for a three-week period before registration begins to assist the advisees with course selection for the coming semester. Students meet with their advisors during this period by requiring them to obtain their 'registration pin' from the advisor, which is needed for registering on-line. The registration pin is unique to each student, and it changes each semester. Some career advising happens during these semi-yearly sessions, and some occurs in or after class. We bring alumni to campus to talk to students about the real world from time to time. Often the speaker will leave with several resumes. The university maintains a Career Services Center that presents workshops to help students prepare for employment.

F3.3 Number and types of assignments

Depending on the course type and outcomes to be evaluated, assignments are created to introduce, strengthen, master, and record proficiencies of all learning outcomes. The program is developing these new assignment assessment tools as the new curriculum is put into place.

F3.4 Professional development initiatives

Demand for specific capabilities change constantly, and a major part of our continuous improvement process for program quality requires that we constantly assess and integrate the most relevant topics within the discipline. We follow this process to ensure that we produce talented graduates who are sought out because they can demonstrate skills (during internships, co-ops, and research experiences) that payoff immediately for employers. Many of our industry partners are following this talent management paradigm, and it is the impetus behind the Center for Undergraduate Research (CUR).

F3.5 Faculty retention initiatives

The University has several strategies to retain qualified faculty, particularly in the technology programs. The Technology program faculty have a teaching load of four courses per semester, which is similar to other programs at the University. In addition, faculty have competitive salaries with similar institutions of higher education. The University also gives tenured faculty an opportunity for professional renewal with a sabbatical leave, after completion of a seven-year period of service to the University.

F.3.6 Quality Improvement Initiatives

The university provides many incentives for quality improvement through faculty development funding, grant funding opportunities, the Center of Teaching and Learning, encouragement for civic learning opportunities through the Crocker Center, research including student involved research, service on curriculum development on the program, department, school and university-wide committees, and others. Within the program, the reenactment of our Industry Advisory Committee and establishment of our internal Assessment Committee will work to guide the continuous improvement and quality of the program.

G Program Outcomes and Continuous Improvement

G.1 Evaluation Procedures

Figure G-1 depicts the continuous improvement process for the Industrial Technology (Engineering Technology) program. Every objective and outcome for the program will be assessed frequently using different assessment tools to implement continuous improvement. Input from the program's constituents initiates the improvement process.

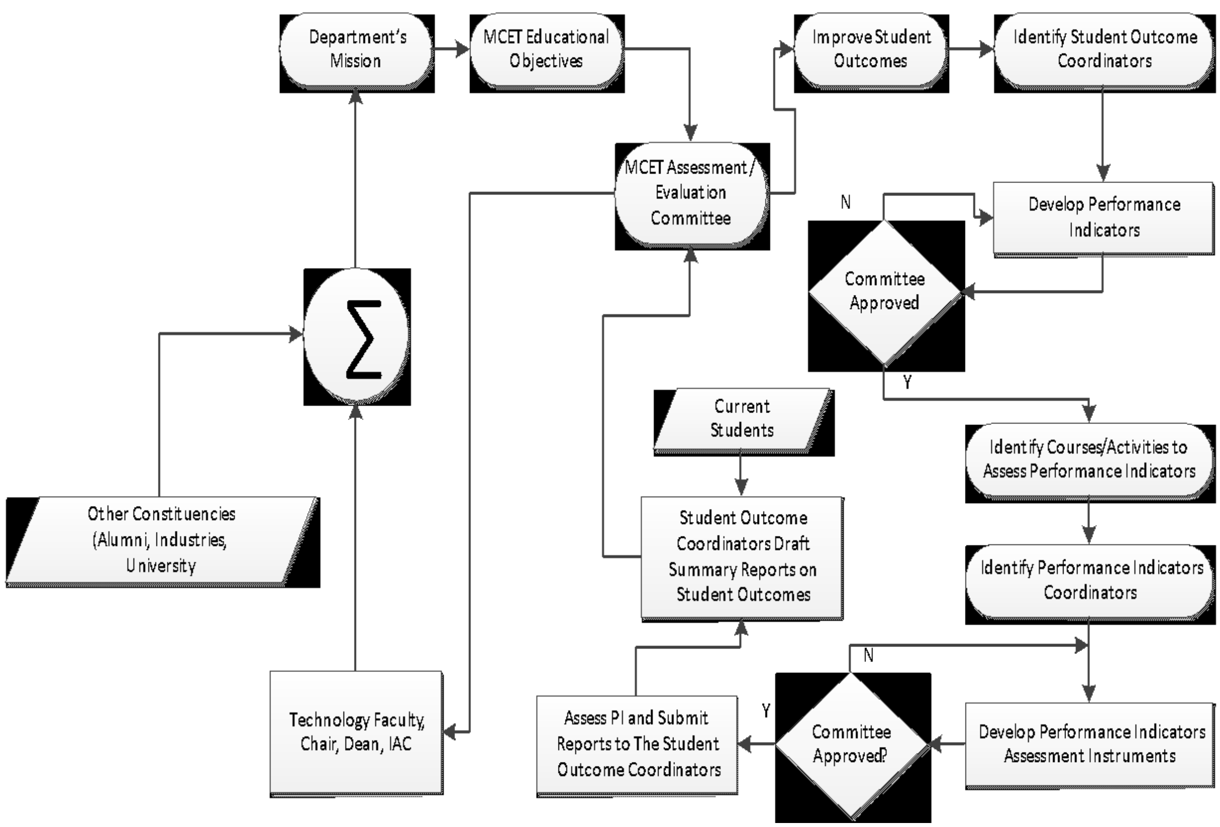


Figure G-1. Industrial Technology (Engineering Technology) Program Continuous Improvement Process

Process Used to Evaluate Objectives

During its semi-annual meeting with the Industrial Advisory Committee (IAC), the department's Assessment Committee (AC) reviews the results of alumni surveys. Each member of the IAC has primary responsibility for one or more Program Educational Objectives and reviews how changes occurring in the profession could be addressed in the Objectives, Outcomes, and curriculum. The review cycle for Objectives follows a three year cycle following the graduation of the first cohort of students. The cycle is outlined below.

January, Year 3:	Results from the Alumni surveys from Years 1 and 2 collected by the faculty and analyzed. The results are presented to the AC for review and presentation to the IAC.
March, Year 3:	IAC meeting to discuss the results of the survey.
May, Year 3:	IAC meeting to present recommendations to the AC and faculty.
August, Year 3:	AC provides reply and recommendations on changes to the Objectives with feedback curricular impacts.
September, Year 3:	Changes approved by AC are implemented by the faculty.

A folder containing data for our continuous improvement of program objectives will be maintained in our ABET Room. During each review cycle, the IAC will form subcommittees for each objective. Each subcommittee will review constituent input with faculty and suggest changes to be approved by the larger IAC body.

The **Outcome Assessment Rubrics** are being established. PI's will be used to assess each outcome as detailed in Criterion 3**.** The PI for outcome **a** is shown below for brevity.

Table G-1. Performance Indicator Sample

Student Outcomes	Performance Indicators
An ability to apply knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve broadly-defined engineering problems appropriate to the discipline	1. Understanding of how to apply ideal gas law. 2. Find force act on particle when displacement function is given 3. Understand how to apply energy equation in the fluid flow

Each assessment is used to assess the student outcomes using rubrics with carefully designed embedded questions to clearly demonstrate the student's comprehension and mastery of the skills. Solutions and content provided by students are evaluated and considered in one of four categories of achievement on a Likert Scale:

4 - Exemplary,

3 - Proficient,

2 - Average

1 – Below Average

The number of students rated at or above average is reported as a percentage of the class. The average rating is determined by the KPI on an assessment rubric. The threshold considered for the courses assessed is a rating of average or better. The course instructor analyzes the results of the assessment and offers suggestions for future improvement of the course. These suggestions are taken into consideration the next time the course is offered. A representative rubric for Outcome 5 is shown in Table G-2.

Table G-2. Sample Rubric

Outcome (5): Teamwork				
Performance Indicators	**Poor (1)**	**Inadequate (2)**	**Adequate (3)**	**Exemplary (4)**
Research and Gather Information	Does not collect any information that relates to the topic.	Collects some basic information - most relates to the topic	Collects some basic information - most relates to the topic	Collects a great deal of information - all relates to the topic
Fulfill Team Role's Duties	Does not perform any duties of assigned team role	Performs very little duties	Performs nearly all of the duties	Performs all duties of assigned team roles
Share in Work of Team	Always relies on other to do the work productivity: Highly productive.	Rarely does the assigned work - often needs reminding	Usually does the assigned work - rarely needs reminding	Always does the assigned work without having to be reminded
Listen to Other Teammates	Is always talking - never allows anyone else to speak	Usually doing most of the talking - rarely allows others to speak	Listens, but sometimes talks too much	Listens and speaks a fair amount

1.1 Student Outcomes Assessment

Table G-3 lists the assessment processes used to gather the data for the evaluation of student outcomes. The frequencies with which these assessment processes are carried out, the expected level of attainment for each of the student outcomes and the extent to which each of the student outcomes is being attained are summarized. Additionally, the direct student outcome assessment process follows the flowchart provided in Figure G-1. The PIs listed in table G-4 were used to assess student outcomes

Table G-3. Assessment Tools and Expected Outcomes

Assessment Tool	Frequency	Expected level of attainment
Alumni Survey (Indirect)	Annually	5/7
Senior Exit Survey (Indirect)	Annually	5/7
Performance Indicators (Direct)	Annually	70% of students rated at or above average level

Our indirect measures will consist of surveys administered to students at the time of graduation to assess the program's success in meeting outcomes. The Senior Exit survey will assesses students' perceptions of how well the program achieved its outcomes.

For direct measure, in the old process, the performance criteria were based on the percentage of students who scored at or above a 60% grade for a selected question or project criteria. If 75% of students scored above a 60% performance benchmark, the course was considered acceptable for supporting outcomes. If less than 75% of students scored above 60%, the performance was a cause for concern. If the percentage of students scoring above 60% fell below 65% then the performance was considered weak.

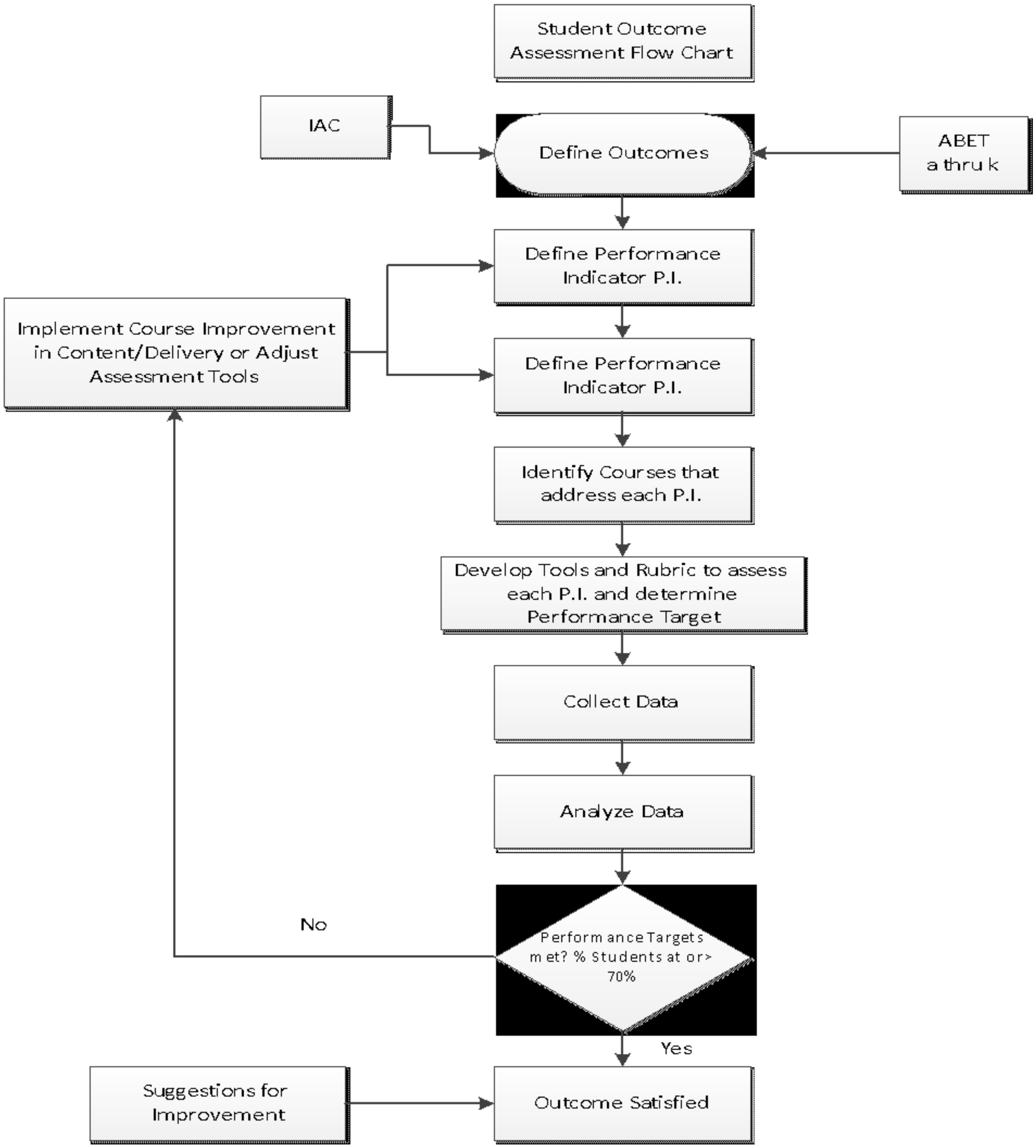


Figure G-1. Assessment Process Flowchart

Table G-4. Performance Indicators, Coordinators, Courses and Assessment Strategies

Outcome	Coordinator	Course	Tool/ Strategy
An ability to apply knowledge, techniques, skills, and modern tools of mathematics, science, engineering, and technology to solve broadly-defined engineering problems;			
1. Understanding of how to apply ideal gas law	Basu	ENGT 2000	Problem
2. Find force act on particle when displacement function is given	Mustafa	ENGT 2020	Project
3. Understand how to apply energy equation in the fluid flow	Basu	ENGT 2000	Project
An ability to design systems, components, or processes meeting specified needs for broadly-defined engineering problems;			
Apply the engineering design process	Whitfield	ENGT 4903	Report/ Problem
Apply derivative and integration to solve kinematics of particles	Mustafa	ENGT4903	Project
An ability to apply written, oral, and graphical communication in broadly-defined technical and non-technical environments; and an ability to identify and use appropriate technical literature;			
1. Relationship of stress-strain	Mustafa	ENGT 2030	Report
2. Ability to determine the volumetric flow rate through the orifice, nozzle, and rotameter.	Basu	ENGT 2000	Report
3. Demonstrate an ability to conduct tests and experiment, and improve engineering technology processes with the experimental results	Chenot	ENGT 4903	Report
An ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes;			
1. Demonstrate technical ability to design a machine part	Whitfield	ENGT 3025	Problem/ project
2. Demonstrate technical ability to design an engineering technology system	Yu	ENGT 4903	Problem/project
An ability to function effectively as a member as well as a leader on technical teams;			
1. Research and Gather Information	Chenot	ENGT 4903	Team Project

2. Fulfill Team Roles Duties	Chenot	ENGT 4903	Team Project
3. Share in Work of Team	Chenot	ENGT 4903	Team Project
An understanding of the need and a commitment to address professional and ethical responsibilities including a respect for diversity;			
1 Demonstrate knowledge and technical ability to solve a constraint-based engineering problem	Basu	ENGT 1700	Report
1. Generate technical solution by identifying and analyzing a broadly defined engineering technology problem.	Yu	ENG4903	Problems
2. Generate technical solution by applying hydraulics and pneumatics to a broadly defined technology problem	Basu	ENGT4903	Report/ Problem
A commitment to quality, timeliness, and continuous improvement;			
1. Testing and quality control	Basu	ENGT 2030	Lab Report
2. Working toward deadlines	Chenot	ENGT 4903	Report/ Project

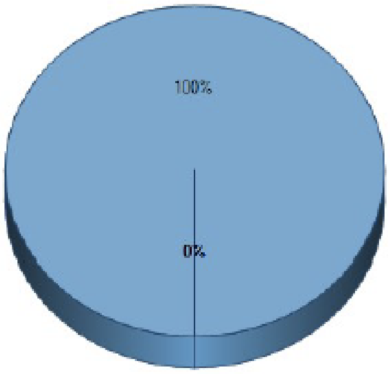
The responsible coordinator for each performance indicator developed rubric for that indicator as well. Detailed rubrics for each performance indicator of outcomes to be assessed will be developed.

Each faculty member who is responsible for a performance indicator summarizes the data and maintains a copy of the reports in an outcome folder which will be kept in the Assessment and Accreditation room.

When all indicators have been analyzed, the appropriate faculty member will summarize all indicators related to each outcome and maintain a copy of the report in outcome folders. The outcome summary is shared and discussed with all ENGT faculty members to make the final decision about whether or not the outcome has been met and what course of action needs to be taken for continued improvement.

G.2 Graduates rating of the program (Graduating Student Feedback survey

results will be provided by Director of Assessment) See sample chart below:



	Response Total	Response Percent
Very Satisfied	0	0%
Satisfied	2	100%
Neutral	0	0%
Dissatisfied	0	0%
Very Dissatisfied	0	0%
Not Working at This Time	0	0%
Total Respondents		2

2. How many times have you changed employers or been promoted since graduation five years ago?

1. I have had the same employer since graduation and have been promoted twice.
2. twice

Total Respondents 2

G.3 Career placement and continuing education opportunities- number and types of career and advanced education: (Graduating Student Feedback survey results will be provided by Director of Assessment)

G.4 Alumni Feedback Survey
Will be administered to alumni at 1, 3, and 5 year intervals (Survey to be launched in Spring 2021). See example below of similar questionnaire:

1. We would like to know about your short-term plans. Please mark each of the following as they relate to you currently:

	Yes	No	Not Applicable	Response Total	Points	Avg
I am currently employed or have a job offer in a field closely related to my degree	50% (1)0% (0)	50% (1)0% (0)	0% (0)0% (0)	2	0	0
I am currently employed or have a job offer in a field that is not related to my degree	50% (1)0% (0)	50% (1)0% (0)	0% (0)0% (0)	2	0	0
I am searching for employment in a field closely related to my degree	100% (2)0% (0)	0% (0)0% (0)	0% (0)0% (0)	2	0	0
I am searching for employment in a field not closely related to my degree	0% (0)0% (0)	50% (1)0% (0)	50% (1)0% (0)	2	0	0
I have been accepted into a graduate program to continue my education at Fitchburg State University	50% (1)0% (0)	50% (1)0% (0)	0% (0)0% (0)	2	0	0
I have been accepted into a graduate or doctoral program to continue my education at another institution	0% (0)0% (0)	100% (2)0% (0)	0% (0)0% (0)	2	0	0
I am not planning to continue my education at this time	50% (1)0% (0)	0% (0)0% (0)	50% (1)0% (0)	2	0	0
I am a member of the Armed Forces	0% (0)0% (0)	50% (1)0% (0)	50% (1)0% (0)	2	0	0
			Total Respondents	2		

10. Rate the quality of the following with respect to the degree you received five years ago:

	Excellent	Good	Fair	Poor	Response Total	Points	Avg
Quality of faculty instruction	0% (0)0% (0)	100% (2)0% (0)	0% (0)0% (0)	0% (0)0% (0)	2	0	0
Level of individual attention	50% (1)0% (0)	50% (1)0% (0)	0% (0)0% (0)	0% (0)0% (0)	2	0	0

11. Please select your level of agreement with the following statements:

	Very High	High	Average	Low	Very Low	Response Total	Points	Avg
Overall satisfaction with my experience with Fitchburg State University	0% (0)0% (0)	100% (2)0% (0)	0% (0)0% (0)	0% (0)0% (0)	0% (0)0% (0)	2	0	0
					Total Respondents	2		

12. Looking back at your academic career at Fitchburg State University, please select your level of agreement with the following:

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Response Total	Points	Avg
The social and interpersonal skills you developed have impacted your life	50% (1)0% (0)	50% (1)0% (0)	0% (0)0% (0)	0% (0)0% (0)	0% (0)0% (0)	2	0	0
You have benefitted from the personal connections you made	0% (0)0% (0)	100% (2)0% (0)	0% (0)0% (0)	0% (0)0% (0)	0% (0)0% (0)	2	0	0
You have benefitted from the social networks of which you were/are a part	0% (0)0% (0)	100% (2)0% (0)	0% (0)0% (0)	0% (0)0% (0)	0% (0)0% (0)	2	0	0
The benefits of attending were worth the financial cost	50% (1)0% (0)	0% (0)0% (0)	50% (1)0% (0)	0% (0)0% (0)	0% (0)0% (0)	2	0	0
					Total Respondents	2		

13. How well did Fitchburg State University prepare you in terms of the following skill sets:

	Very Well	Well	Neutral	Poorly	Very Poorly	Response Total	Points	Avg
Ability to think analytically and logically	0% (0)0% (0)	100% (2)0% (0)	0% (0)0% (0)	0% (0)0% (0)	0% (0)0% (0)	2	0	0
Ability to acquire new skills and knowledge on your own	0% (0)0% (0)	100% (2)0% (0)	0% (0)0% (0)	0% (0)0% (0)	0% (0)0% (0)	2	0	0
Ability to use the knowledge, ideas, or perspectives gained from your major field	50% (1)0% (0)	50% (1)0% (0)	0% (0)0% (0)	0% (0)0% (0)	0% (0)0% (0)	2	0	0
Ability to orally communicate well	50% (1)0% (0)	50% (1)0% (0)	0% (0)0% (0)	0% (0)0% (0)	0% (0)0% (0)	2	0	0
Ability to judge information/ideas/actions/conclusions based on sources/methods/reasoning	50% (1)0% (0)	50% (1)0% (0)	0% (0)0% (0)	0% (0)0% (0)	0% (0)0% (0)	2	0	0
Ability to write effectively	0% (0)0% (0)	0% (0)0% (0)	50% (1)0% (0)	50% (1)0% (0)	0% (0)0% (0)	2	0	0
Ability to use information technology in intellectual and/or professional pursuits	50% (1)0% (0)	50% (1)0% (0)	0% (0)0% (0)	0% (0)0% (0)	0% (0)0% (0)	2	0	0
Ability to understand and appreciate cultural and ethnic differences between people	0% (0)0% (0)	50% (1)0% (0)	0% (0)0% (0)	50% (1)0% (0)	0% (0)0% (0)	2	0	0
Ability to understand international perspectives on economic, political, social, and cultural issues	0% (0)0% (0)	50% (1)0% (0)	0% (0)0% (0)	50% (1)0% (0)	0% (0)0% (0)	2	0	0
Ability to gain an understanding of or appreciation for the arts	50% (1)0% (0)	0% (0)0% (0)	50% (1)0% (0)	0% (0)0% (0)	0% (0)0% (0)	2	0	0
Ability to understand and apply quantitative principles and methods	0% (0)0% (0)	0% (0)0% (0)	100% (2)0% (0)	0% (0)0% (0)	0% (0)0% (0)	2	0	0
Ability to understand scientific method	0% (0)0% (0)	50% (1)0% (0)	0% (0)0% (0)	50% (1)0% (0)	0% (0)0% (0)	2	0	0
					Total Respondents	2		

14. How well did Fitchburg State University prepare you for the following personal and professional situational skill sets:

	Very Well	Well	Neutral	Poorly	Very Poorly	Points	Avg

Your ability to work as a member of a team or group	0% (0)0% (0)	100% (2)0% (0)	0% (0)0% (0)	0% (0)0% (0)	0% (0)0% (0)	**2**	**0**	**0**
Your ability to get along with people of diverse backgrounds and perspectives	0% (0)0% (0)	50% (1)0% (0)	0% (0)0% (0)	50% (1)0% (0)	0% (0)0% (0)	**2**	**0**	**0**
Your ability to lead others effectively	0% (0)0% (0)	50% (1)0% (0)	0% (0)0% (0)	50% (1)0% (0)	0% (0)0% (0)	**2**	**0**	**0**
Your ability to evaluate and choose between alternative courses of action	0% (0)0% (0)	100% (2)0% (0)	0% (0)0% (0)	0% (0)0% (0)	0% (0)0% (0)	**2**	**0**	**0**
Your awareness of contemporary issues and their cause and consequences	50% (1)0% (0)	0% (0)0% (0)	50% (1)0% (0)	0% (0)0% (0)	0% (0)0% (0)	**2**	**0**	**0**
					Total Respondents	**2**		

G.5 Student

Learning outcomes
The program will be using the following methodology to evaluate the students' competency in terms of the learning goals, skills, and other competencies previously described. These assessment tools include:

1. Written exams (midterms, finals etc.) and quizzes for assessing overall course content comprehension related to learning outcomes
2. Laboratory report submission to evaluate student’s performance in activity-based courses learning outcomes for exam ability to conduct land surveying
3. Written research papers assess communication learning related outcomes.
4. Evaluation of an Engineering Document accuracy and quality (e.g. evaluation of quality and accuracy of engineering element design calculation sheet
5. Evaluation of portfolio (content, preparation and presentation) to assess comprehension and communication related learning outcomes
6. Engineering Technology Capstone course to collectively assess the student’s knowledge and skills to use modern tools of math and science, design solutions to technical problems, communicate, test and measure results, work in teams, be professionally ethical and socially responsible, and committee to quality, timeliness and continuous improvement.
7. Passing grade or better in professional licensing exams (e.g. Fundamental of Engineering exam)

G.6 Assessment overview of the program

a. Student Learning Outcomes (SLOs)/Objectives

b. SLO mapping to courses
c. Summary of findings by year (longitudinal data over the most recent five year span)
d. Annual Assessment Report findings summarized here
e. Direct and indirect assessment data and analyzation
f. Ongoing changes made to the program in response to the assessments (based on data collected and analyzed over the most recent five year span)
g. Other possible data
h. Scholarly and creative productions
i. Internship and service learning scores/evaluations completed by faculty and internship or service learning supervisor

G.7. Professional and community engagement

a. Include service learning components within the program
    - continue involvement with the Crocker Center for Civic Engagement
    - pursuing grant opportunities for student/local government projects

G.8 National certification and examination pass rate

Coordinate curriculum with the Fundamentals of Engineering (FE) examination

G.9 Career placement and continuing education opportunities- number and types of career and advanced education

a. Alumni Feedback Survey will be administered to alumni at 1, 3, and 5 year intervals

G.10 Employer rating of graduates

a. Internship Supervisor evaluations will be compiled and evaluated
b. Program Advisory Council feedback will be compiled and evaluated
c. Employer feedback will be compiled and evaluated

G.11 Trend Data Reflection/Analysis

a. Time to degree completion will be compiled and evaluated
b. Graduation rates will be compiled and evaluated

H. Analysis and Action Plan for the Future

H1. Comparative strengths and distinctiveness, and areas of improvement across all program Levels

Recognitions of quality of the program

1) Updated curriculum, program and assessment guidelines
2) We move to actively track our graduates to assess and improve this program as a whole.
3) The internship placement of graduates is growing
4) The ability to attract students to the program will be strengthened
5) The graduation rates will be monitored and evaluated to aid in student success rates

H2. Opportunities to extend existing strengths and resources in place or needed

- Updated curriculum, program, feedback systems, and assessment guidelines are geared to strengthen the program

H3. Weaknesses found during the self-study

General assessment

H4. Opportunities for addressing weaknesses

Start up of new program and assessment tools

H5. Positioning of program to address future direction of the discipline in the next five years

core courses?

H6. Action Plan for next five years

I. Key objectives and strategic actions to achieve each objective
   a. Full implementation of recently created curriculum and program changes
   b. Review and and incorporate comments and recommendations from this program review
   c. Establish new program Industry Advisory Committee (IAC)
   d. Establish new Internal Assessment Committee
   e. Update and coordinate with ABET ETAC evaluation criteria and processes
   f. Fully establish and implement evaluation rubrics
   g. Establish record keeping systems, record SLOs
   h. Coordinate with Assessment office to develop and implement graduate surveys
   i. IAC meetings and feedback
   j. Implement IAC feedback
   k. ABET ETAC preliminary review
   l. Schedule ABET ETAC visit
   m. ABET ETAC evaluation

n. Review and implement ETAC recommendations

b. Timeline, with milestones and measurable outcomes to determine progress and measure success

2020-2021	a - j above
2021-2022	k - m above
2022-2023	n above

c. Method of achieving objectives

review and implementation of IAC and ABET ETAC recommendations

d. Internal improvements

similar to c above

e. Improvements that can be achieved only with additional resources and plans to obtain these resources

As the program is implemented, additional resources will be requested from the university and through outside grants, donations and support through our IAC and the industries and disciplines we support.

Major curricular changes since last review (or past five years)

Industrial Technology Curriculum Transformation to Engineering Technlogy

To help meet these growing trends and to work toward national accreditation guidelines, the department evaluated its past curriculum and developed the following AUC proposals that were submitted and approved to transform our day program curricula including the changing the Industrial Technology Program to the Engineering Technology Program:

AUC 2019 #69 approved to transform the Industrial Technology Program to the Engineering Technology Program, AUC 2019 #62 approved to transform the Architecture Concentration from Industrial Technology to Engineering Technology. AUC #63 2019 approved to transform the Electronics Concentration from Industrial Technology to Engineering Technology. AUC #64 2019 approved to transform the Energy Management Concentration from Industrial Technology to Engineering Technology. AUC 2019 #65 approved to transform the Manufacturing Concentration from Industrial Technology to Engineering Technology.

Following course proposals were submitted and approved to support AUC 2019 #69, 62, 63, 64 and 65; AUC 2018 #s 18, 19, 20, 21, 22, 23, 24, 25, 26, 28, 30, 31, 32, 33, 34, 35 , 36, 37, 38, 41; and AUC 2019 #s 23, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 42, 44, 45.

H7. Resources necessary to achieve the plan

a. Faculty/staff
    a. Current faculty and staff are sufficient for our current launch. As the program is marketed and grows to meet its potential, additional faculty members will be required to meet demand.

b. Budgetary
    a. Additional funding will be necessary to match the growth of the program including faculty and staff salaries, updating equipment and technology, and expansion and redesign of our facilities. The university has committed to facility redesign and expansion planning and the department has recently completed an initial facility needs assessment with the university's architectural consultant.

Appendices

a. Student Data

Five Year Enrollment Trend Data: admissions, diversity, retention rates, graduation rates, years to graduate, course, major and minor enrollments

	AY 13	AY 14	AY 15	AY 16	AY 17[1]
Percentage of incoming freshmen class[4]	5.89 %	5.75 %	3.08 %	5.08 %	4.58 %
Number of incoming transfer majors	11	19	21	17	15
Percentage of incoming transfer class[4]	2.78 %	4.38 %	5.01 %	4.31 %	3.39 %
Number of Minors					
CONS Construction Technology Minor	2	3	4	2	1
ELEC Electronics Engineering Technology Minor	1	2	1	1	1
GRAP Graphics Minor***	0	0	0	0	0
INTR Industrial Training Minor	1	6	4	3	0
MAN Manufacturing Technology Minor	2	1	1	1	0
TETA Technical Theater	0	0	0	6	6

	AY 13	**AY 14**	**AY 15**	**AY 16**	**AY 17[1]**
Number of Majors[2]	**215**	**212**	**188**	**196**	**194**
Overall declared majors[3]	3,776	3,862	3,835	3,875	3,904
Percentage of overall declared majors	**5.69%**	**5.49%**	**4.90%**	**5.06%**	**4.97%**
Architectural Technology	54	46	46	48	46
Construction Technology	86	91	69	79	72
Electronics Engineering Technology	25	29	25	23	28
Energy Management Technology	11	10	10	7	6
Manufacturing Engineering Technology	20	20	23	21	27
Technical Theater	18	16	15	18	14
Industrial Technology (Undeclared)	1	0	0	0	1

	AY 13	AY 14	AY 15	AY 16	AY 17[1]

	AY 13	AY 14	AY 15	AY 16	AY 17[1]
Number of incoming freshmen majors	41	44	21	37	33

a. Overall Enrollments

i. Courses
ii. Majors and Minors

	AY 13	AY 14	AY 15	AY 16	AY 17[1]
Total Enrollment in Industrial Technology classes	**1,212**	**1,085**	**1,015**	**1,119**	**1,094**
Total Enrollment in All Classes	32,683	33,952	34,081	34,062	34,169
Percentage of total enrollment: Industrial Technology classes	**3.71%**	**3.20%**	**2.98%**	**3.29%**	**3.20%**
Graduates in the Major	**57**	**43**	**39**	**36**	**48**
Percentage of overall graduates	**7.27%**	**5.35%**	**5.41%**	**4.79%**	**6.12%**
Architectural Technology	14	8	7	8	12
Construction Technology	18	20	17	15	19
Electronics Engineering Technology	5	2	4	3	9
Energy Management Technology	3	2	4	2	1
Manufacturing Engineering Technology	8	6	3	2	3
Technical Theater	8	4	2	4	3
Technology Education, BSE	1	1	2	2	0
					1
Graduates in the Minor					
Construction Technology Minor	0	1	0	1	1
Electronics Engineering Technology Minor	0	0	0	0	1
Graphics Minor***	1	0	0	0	0

Industrial Training Minor	1	4	1	2	0
Manufacturing Technology Minor	1	0	0	1	0
Technical Theater	0	0	0	0	1

b. Diversity of Students in the Major

i. Race/Ethnicity
ii. Gender

c. Retention Rates

i. Retention in the Major
iii. Retention in any Major

Retention Rates [5]

Retention Rate in Major - Industrial Technology	76.92%	73.68%	73.68%	66.67%	57.58%
Retention Rate Changed Major - Industrial Technology	5.13%	5.26%	5.26%	2.78%	6.06%
Retention Rate in Major Institutional	62.52%	62.15%	58.75%	62.36%	66.09%
Retention Rate Changed Major Institutional	15.56%	15.19%	16.11%	12.55%	12.40%

f. Time to Degree Completion

D-F-W Rates*

g. **Average Class Size***

h. Admissions Funnel*

* Note: The Office of Institutional Research and Planning will begin providing these three data trends in 2022-2023 Academic Year to the department for inclusion in the reflection on student data.

j. Academic Advising

k. Effectiveness of advising from perspective of students, faculty (include a paragraph or two in the text)

l. Integration into department—clubs, departmental committee representation

m. After graduation—employment, graduate school