

## **College of Engineering Technology**

### **Strategic Execution Plan Outline**

Create a College of Engineering Technology strategic execution plan that aligns with the Ferris State University strategic plan.

Over the next ten years, we will grow the College of Engineering Technology in the number of students we serve, and in the quality programs offered in a financially sustainable manner. We will create the engineers and engineering technologists who will design the products and services that will drive our economy forward. Ferris Forward!

I want to be known as the engineering college intrinsically tied to the real world—a confluence of industry knowledge, 135 years of theory to practice learning, and an enduring desire to reimagine what is possible. We are engineers, designers, and technologists — professors with years of industry experience who mold the eager and determined; students who pursue their passions with tenacity and resilience. Together, we unriddle the impossible and reinvent the way things are done.

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Ferris State University

## Background and problem definition

Create a College of Engineering Technology strategic execution plan that aligns with the Ferris State University strategic plan. Over the next four years CET will focus on outcomes contributing to the following FSU goals:

- Increase Student Enrollment to 14,000 by 2024
- Increase online student credit hours by 5% annually.
- Create 3 new market driven degree programs annually.
- 3% increase in minority students annually.
- Improve the six-year graduation rate to 65%.
- Increase grants by \$1M annually

### Strategic Execution Plan

We need bold and courageous ideas necessary and sufficient to generate large scale enrollment growth, achieve a sustainable financial model and enhance operational excellence.

1. We need a realistic plan for enrollment growth that leverages the strengths, unique infrastructure and rich traditions of the university.
  - a. Create growth initiatives to overcome the demographic shift and grow enrollment.
  - b. Identify new market driven degrees.
2. We must become more efficient at instructional delivery. The average class size, while heralded as a differentiator, has created an unsustainable financial model. An average class size of 30 would still place CET among the lowest average class size within Michigan universities (meaning 30 would still be a differentiator). However, this simple change would create a more sustainable financial model.
  - a. Create a college committee to solicit faculty solutions to achieve this goal.
3. We need to create operational excellence around student experience, student learning outcomes, grants, research, and industry partnerships. There are pockets of excellence, but these best practices are not systematically operationalized into the processes of the College. They are people centric.
  - a. Create a college committee to work with faculty, share best practices and enhance program quality, accreditation, grants, research and industry partnerships.



## Executive Summary – CET Strategic Execution Plan

**Create an AAS to BS degree completion program** with community college transfer students to offset the declining 18-year-old demographic. This builds upon the infrastructure that President Eisler built and will generate approximately 475 students per year within Michigan producing \$5M in tuition revenue annually. Grow the program nationally to 900 students and \$10M in annual revenue.

**Create a “Complete Michigan” campaign.** There are more than 1M people in Michigan with some college but no degree (SCND). This population is typically the hardest hit with student debt. A Complete Michigan campaign will enhance workforce development within the state, help many pay off student debt already accumulated and increase their earning potential and quality of life. Potential workforce grant idea with state and/or DoL. Research suggests 24,000 students highly likely to finish a baccalaureate degree within two years of enrollment within Michigan.

### New Market Driven Degrees

BS Cost Engineering – 43,000 jobs available, theory to practice

BS Materials Engineering – leverages plastics, manufacturing, welding and a strong materials lab.

Master of Engineering – professional practice engineering focused on the project and product level

Doctor of Engineering – advanced professional practice focused on the mega project and firm level

### Create a college committee to solicit faculty solutions to increase instructional efficiency

Collaboratively work with faculty to develop solutions to increase average class size and SCH/FTE production that creates a more sustainable financial model.

### Create a college committee to work with faculty, share best practices and enhance program quality

Performance Scorecard to include qualitative and quantitative measures

SLO's, Assessment Cycle and Faculty Credentials

Specialty Accreditations

### Create a college committee to work with faculty to grow grants, research and industry partnerships

\$1M in CET grants by 2024

Strategy	Enrollment Growth	Online Enrollment	Market Driven Degree	Incr. Grants	6 yr Graduation Rate	Financial Sustainability	Operational Performance
<b>Growth Initiatives</b>							
AS to BS degree completion for community college grads	✓	✓	✓	✓	-	✓	✓
Complete Michigan... 1M Some College, No Degree	✓	✓	✓	✓	-	✓	✓
<b>Market Driven Degrees</b>							
Add BS Cost Engineering	✓	-	✓	-	-	✓	✓
Add BS Materials Engineering	✓	-	✓	-	-	✓	✓
Add Master of Engineering, Professional Practice	✓	✓	✓	✓	-	✓	✓
Add Doctor of Engineering, Professional Practice	✓	✓	✓	✓	-	✓	✓
<b>Enhance Performance</b>							
Performance Scorecard	-	-	-	-	✓	✓	✓
College Committee: Enhance Program Quality	-	-	-	-	✓	✓	✓
College Committee: Increase Instructional Efficiency	✓	-	-	-	✓	✓	✓
College Committee: Grants and Innovative Program Development	✓	✓	✓	✓	✓	✓	✓

### First strategic growth initiative

Create an AAS to BS degree completion program with the community colleges in Michigan. We do this by creating generous transfer agreements with every community college in Michigan and then cultivate the pipeline of students. The goal is to offset the declining 18-year-old demographic with community college transfer students.

This builds upon the infrastructure that President Eisler built during the last downturn. While all 15 public universities have some affiliation with the state’s community college system, none has the connection to all 28 state colleges like Ferris State University.

The community college’s production of associate degree graduates bottomed out in 2019 and is expected to increase through 2030. This is possible because the average age of community college students oscillates between 28 and 31 (ACCE). Therefore, while the population of 18-year-olds graduating from the high schools will continue to decline over the next decade, the community college graduates should be relatively stable.

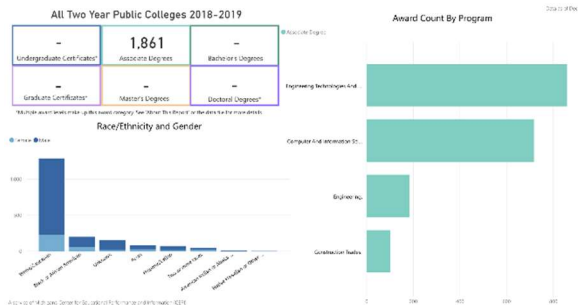
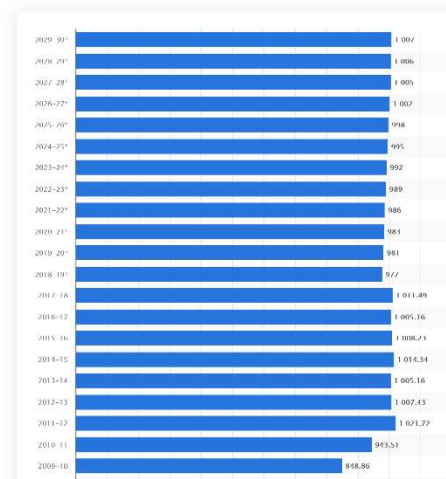
The AAS to BS is unique because most universities have limited transfer options for AAS graduates within the state of Michigan and around the country.

Employers increasingly prefer future managers and leaders to have a bachelor’s degree. While only a few years ago an A.A.S. was fully qualifying for career advancement, this is no longer the case. Within the CET, our industry advisory boards are telling us that the baccalaureate degree is the new standard for supervisory positions.

Many occupations within the engineering, engineering technology, design and construction industries are among the fastest growing in the state and nation.

The 28 public community colleges graduate about 1,900 students with degrees that directly feed into programs within CET. **Capturing approximately 10% of these graduates in one of the three modalities above would generate approximately 475 students per year in a steady state environment producing \$5M in tuition revenue annually.** Over the next ten years, that’s \$50M and 1,500 graduates.

Society | Education & Science  
Number of Associate's degree recipients in the United States (in 1,000s)



A few operational details. I have developed this solution and implemented it at my former institution. Here are the highlights of the delivery.

The A/AS to BS completion within CET degree programs shall have three pathways:

- 1) transfer to FSU main campus (25%).
- 2) complete at a handful of community college locations where the labs and credentialed faculty exist in sufficient numbers (50%).
- 3) online with short residency on the main campus (25%).

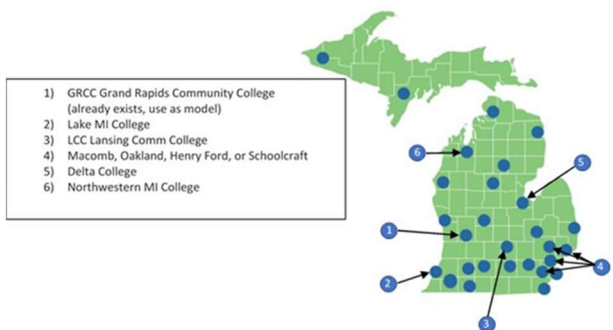
My experience shows. those students that can come to the main campus, will. Students want the traditional college experience. Those students that are place bound will opt for the off-site locations second and online last.

For those students not coming to the main campus, we are proposing a lock-step, semester-sequenced baccalaureate program structured to be completed over three years. Informed by the latest research to maximize completion rates, the AAS to BS completion program is structured to deliver the last two years of the bachelor's degree (60 CrHrs), 20 credit hours per year for three years with continuous enrollment. Research has shown that programs with part-time students following this structure show dramatic increases in completion rates. This structure will also enable our A.A.S. graduates to complete their baccalaureate degree while working. Market research indicates this is important to those not coming to the main campus.

In terms of outreach and recruitment, at my previous institution, I credentialed faculty at the community college to teach both at selected sites and online. We selected only the most qualified, most respected faculty. These faculty will naturally advise the top 10% of their AAS graduates to continue their education at the baccalaureate level at Ferris State University, and take the classes they teach. The implementation has a built-in marketing plan.

Developing the relationships at the partnering community college is the key to recruiting students. We need to have a visible presence at these campuses. We also minimize the negative impact to the local community college, especially when the students transfer prior to earning the associate degree. We can offer reverse articulation agreements to complete students. This helps with the community college performance metrics. We can also offer student to complete their general education at the community college. This helps with enrollments at the community college. We need to be a good partner.

In terms of locations throughout Michigan, we have identified preliminary sites based upon knowledge of the programs offered, adequate laboratory spaces and supply of locally qualified adjunct faculty. The list of sites also provides a decent coverage of the entire state. The sites also track well against the population centers of the state.



These activities will be coordinated with the Dean of EIO, Steve Reifert. Preliminary conversations have taken place and both deans are committed to collaborating and delivering large scale growth.

## Data

The data for this initiative is primarily MCCA, ACCE, IPEDS, and US BLS data. Plus, my personal experience implementing this initiative at my previous institution.

## Collaboration

There are numerous opportunities for collaboration and partnership. Some will be included by design and others will evolve organically.

## Metrics

I have started to develop leading and lagging indicators that we can use to manage this and other growth and quality initiatives. See separate report on performance indicators.

## Diversity

This initiative will also increase the number of minority students served. Community colleges historically serve more minority and economically disadvantaged students, so developing an AAS to BS completion program in partnership with the community colleges should increase the participation of minority students in CET degree programs.

## Grow the AAS to BS program Nationally

The same opportunity exists nationally that exists within Michigan. If we block articulate the AAS degree into the BS programs by CIP code, the AAS graduates will start the BS completion program as true juniors. There are still relatively few community college baccalaureates throughout the country. And, the need for STEM baccalaureates is increasing as the very nature of work is shifting to highly technical skills-based work.

The market for this national AAS to BS online completion program is extensive.

- Well over 54,000 students at 1,152 institutions nationwide earn their associate's degree in STEM fields each year (*National Center for Education Statistics*). With few well-articulated A.A.S. to B.S. pathways for STEM fields, many of these students have no clear pathway to continue their education.

We can get AAS students across the nation into a baccalaureate program they can complete on campus full time or online while working full time. Capturing approximately one half of one percent of these graduates would generate another 475 students per year in a steady state environment producing another \$5M in tuition revenue annually. Ferris State University offers out of state students the same low instate tuition, a real advantage in the national market.

## Bottom line – The contributions to university strategic goals

This initiative will grow CET unduplicated headcount by more than 10% by 2024. This is more than the CET student count the last time the university posted 14,000 students. CET will grow online credit hours by more than 5% annually. CET will add minority enrollment with the community college partnership. Within five years this initiative will generate \$5M annually in tuition revenue.

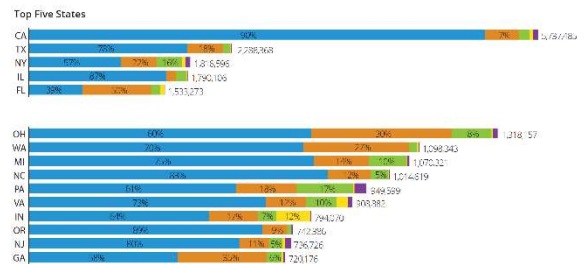
## Second strategic growth initiative

Create a “Complete Michigan” campaign. There are more than 1M people in Michigan with some college but no degree. Research by the National Student Clearinghouse Research Center indicates 10% of this population has at least two years of education and is highly likely to complete a degree. I propose creating a Complete Michigan campaign to identify these individuals and help them complete a baccalaureate degree.

Michigan is #8 in the top ten states with the most people with Some College, No Degree (SCND). If you adjust for population, Michigan is #2 SCND per capita second only to California. This is a staggering percentage of the population carrying some college debt but without the benefit of a degree to pay off the debt.

A Complete Michigan campaign will enhance workforce development within the state, help many pay off student debt already accumulated and increase their earning potential and quality of life. This seems like a perfect opportunity for a state workforce grant and/or a national Department of Labor grant.

Figure 3. Some College, No Degree Population by State and Institution Type of Last Enrollment: 2018



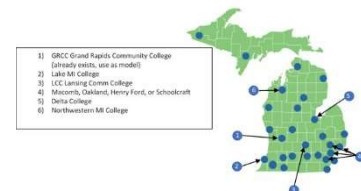
Most of the research indicates the most likely students to complete a baccalaureate are those with two years of college completed. This is a population of about 100,000 students. If we can capture 20% of this population over a period of 10 years, we would add 2,000 students to our rosters every year for a decade. The potential impact to the state and the university is significant. The potential financial impact to the university is \$240,000,000 over the life of the program.

The retraining of a workforce for jobs of the future is especially important now. This will require programs for working adults with a similar structure described in the AAS to BS completion initiatives.

BS completion within CET degree programs shall have three pathways:

- 1) transfer to FSU main campus.
- 2) complete at a handful of community college locations where the labs and credentialed faculty exist in sufficient numbers.
- 3) online with short residency on the main campus.

For those students not coming to the main campus, we are proposing a lock-step, semester-sequenced baccalaureate program structured to be completed over three years. CET will use the AAS to BS infrastructure to serve the off-campus students.



## Bottom line Impact

**The potential exists for \$240,000,000 in tuition revenue over the life of this program**  
**20,000 residents of Michigan earning baccalaureate degrees**

### **Third strategic growth initiative**

Identify four market driven degree programs that will drive enrollments in high demand and emerging career fields. We propose developing these market driven programs over the next four years.

**BS Cost Engineering** - Cost engineering is the engineering practice devoted to the management of project and/or product cost, involving such activities as estimating, cost control, cost forecasting, investment appraisal and risk analysis. Cost Engineers budget, plan and monitor large scale products and portfolio of projects. They seek the optimum balance between cost, quality and time requirements. This requires they understand the engineering systems involved in the development of large-scale projects and complex products.

This will be a BS Engineering degree, not a BS Engineering technology degree. The program will be ABET accredited. Currently there are over 1,000 Cost Engineering jobs listed on Indeed.com within Michigan and more than 43,000 cost engineering jobs listed for the united states. This job transcends industry sectors with cost engineering jobs listed in Manufacturing, Energy, Transportation and Logistics, Aerospace, DoD, Health Sciences, IT/systems, Software, Pharmaceuticals, and Construction. This leverages the unique expertise of and the College of Engineering Technology in manufacturing, and product design, and will remain true to the integrated theory to practice philosophy of Ferris State University.

We envision specializations or certificate programs within this degree program in engineering management, sales engineer, engineering business development, and perhaps engineering entrepreneurship. While engineering sales and engineering entrepreneurship jobs represent a small number of jobs, we see this as a potential for engineers to create new products and new businesses in the future.

**BS Materials Engineering** - Materials engineers design and create new materials and the processing technology to produce those materials. Job duties include analyzing materials and data, conducting tests, troubleshooting, monitoring performance, insuring quality control and creating documentation.

Materials engineers may be responsible for developing new methods of testing, training technicians and lab workers, maintaining inventories and ordering supplies. Engineers must also stay up-to-date on industry standards, government regulations and new developments in their field.

This will be a BS Engineering degree, not a BS Engineering technology degree. The program will be ABET accredited. Currently there are over 100 Material Engineering jobs listed on Indeed.com within Michigan and more than 1,000 Material engineering jobs listed for the united states. This job transcends industry sectors with materials engineering jobs listed in Manufacturing, Energy, Transportation and Logistics, Aerospace, DoD, Health Sciences, Pharmaceuticals, Medical Device and Construction. This leverages the unique expertise of and the College of Engineering Technology and will remain true to the integrated theory to practice philosophy of Ferris State University. This program will build on the existing materials lab which includes non-destructive testing.

We envision specializations or certificate programs within this degree program in polymers, metals and composites as well as non-destructive testing. We envision collaboration with the built environment programs as well as potential partnerships with optometry, pharmacy and health programs as the medical device and pharmaceutical industries are using more engineered materials.



**Master of Engineering** – this professional practice graduate degree will focus on the “practice” of engineering rather than research. The Master of Science degree is a research degree which is generally accepted as preparation or an intermediate step toward the PhD degree. In contrast, the professional master’s degree is typically a non-research-based degree focusing on the practice of a profession like architecture, engineering, and nursing. The M.Engr. degree will have 18 graduate hours in an engineering discipline with the balance of the hours in professional practice courses focused at the project or product development level. The M.Engr. student will develop a capstone project integrating technical and professional practice knowledge. The Master of Engineering degree program will accept both engineering and engineering technology students who want to advance to a project or product engineering manager role. Many of the professional engineering societies have endorsed professional graduate degrees as the first professional degree as the professions have become more complex.

This job transcends industry sectors with engineering manager jobs listed in Manufacturing, Energy, Transportation and Logistics, Aerospace, DoD, IT/systems, Software, Pharmaceuticals, and Construction. This leverages the unique expertise of and the College of Engineering Technology in manufacturing, and quality, construction and product design and will remain true to the integrated theory to practice philosophy of Ferris State University. There are currently 1,000 engineering manager positions listed for Michigan and more than 10,000 engineering manager jobs nationally. All require an undergraduate degree in engineering and most also prefer an advanced technical degree.

The screenshot shows a job listing for 'Engineering Manager/Director' in Novi, MI, with a salary range of \$80,000 - \$110,000 a year. The listing includes requirements such as 10 years of Engineering Management and a Bachelor's degree. The qualifications section states that a Bachelor's degree in Mechanical Engineering, Electrical Engineering, or a related field is required, with an advanced technical degree preferred. Annotations include a blue cloud around 'Easily apply' and 'Urgently hiring', another around the job title, and a third around the specific degree requirements in the qualifications section.

Targeted Audience – Who are the potential students?

Many engineers with undergraduate degrees in mechanical, electrical, aerospace, manufacturing, and related engineering who wish to progress into cost engineering, sales engineering, engineering manager, project or product line manager will find this degree more appealing than a traditional MBA as the business skills are integrated and applied specifically to the practice of engineering. However, we see collaboration opportunities with the college of business.

We also envision this degree will be popular with community college faculty who are looking to increase their credentials. This will be a pathway for many of our own faculty to gain advanced degrees in field. This degree having 18 graduate credit hours in field, will satisfy the HLC and university faculty criteria for instruction. There have been preliminary discussions to collaborate with the doctorate in community college leadership program for guided electives for these students.

**Doctor of Engineering** – this professional practice doctoral degree will focus on the “practice” of engineering rather than research. The PhD degree is a research degree with the sole goal of preparing academic researchers. In contrast, the professional doctorate is typically a non-research-based degree focusing on the practice of a profession like law, engineering, optometry and pharmacy. The D.Engr. degree will focus on advanced practice at the engineering firm or mega project level. The D.Engr. student will develop a praxis project integrating technical and professional practice knowledge to solve a complex problem that advances the practice of engineering rather than creating new knowledge. The research skills of these practitioners will be applied research in the advancement of the practice.

The Doctor of Engineering degree program will accept both engineering and engineering technology students as well as related architecture, construction and computer science programs who aspire to senior leadership levels within engineering and technology firms or would like to create their own engineering firm.

This job transcends industry sectors with engineering director, project executive, chief engineer, VP engineering, etc. jobs listed in Manufacturing, Energy, Transportation and Logistics, Aerospace, DoD, IT/systems, Software, Pharmaceuticals, Architecture, Engineering and Construction. This leverages the unique expertise of and the College of Engineering Technology in manufacturing, mechanical design, construction, and product design and will remain true to the integrated theory to practice philosophy of Ferris State University. There are currently 1,000 engineering manager positions listed for Michigan and more than 10,000 engineering manager jobs nationally.

There are a few Doctor of Engineering and Master of Engineering programs offered at traditional research universities. The goal of these programs are the stated goals listed here. However, those programs are developed and taught by research faculty that have largely never practiced engineering. Most of these programs have become mini-research degrees with little to no focus on professional practice.

The practice of engineering is a holistic design process requiring the integration of broad knowledge across a wide range of content areas that is much different than the narrow and deep focus of the PhD. Engineers in advanced professional practice are safeguarding life safety and must develop an almost clinical professional judgement from professional engineers and scholar-practitioners with this expertise. Our program will utilize the integrated theory to practice approach taught by scholar-practitioners with real-world design experience in addition to advance academic credentials. Because of this unique differentiation, our graduates will be preferred and sought after by industry.

This is also an opportunity to grow our own terminally qualified faculty with doctoral degrees in field. Because our faculty largely come from industry with decades of experience, this advanced practitioner doctoral program will better align with their professional skills than a PhD in engineering.

These four market driven degree programs will transform the College of Engineering & Technology as well as produce generations of advanced engineering practitioners that will transform our world. These engineers will design, test, manufacture, sell, and manage the products and services that will drive our economy forward.

Ferris Forward!

## Faculty Buy-In and Implementation

I am assembling three faculty committee within CET to help finalize how we will develop the final solution to three very important issues that will impact our ability to grow, grow efficiently with a sustainable financial model and correct years program quality issues. We will also be looking at opportunities for grants, partnerships internally and externally and developing new market driven degree programs. All of these issues require faculty participation. These three committees to finalize the solutions is imperative.

However, I have created innovative growth initiatives and identified instructional efficiency metrics and quality gaps that must be addressed. I have worked with directors/chairs, program coordinators and staff to craft a draft of these solutions as a starting point for these faculty discussions. These initiatives have been vetted with key stakeholders across the university. These initiatives align with the university strategic plan. The initiatives are both necessary and sufficient to move the needle on the key performance indicators for growth, efficiency and program quality. The specifics of how we implement these initiatives will be developed in partnership with faculty.

### Create a college committee to solicit faculty solutions to increase instructional efficiency

Collaboratively work with faculty to develop solutions to increase average class size and SCH/FTE production that creates a more sustainable financial model.

### Create a college committee to work with faculty, share best practices and enhance program quality

Performance Scorecard to include qualitative and quantitative measures  
SLO's, Assessment Cycle and Faculty Credentials  
Specialty Accreditations

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\$1M in grants within by 2024

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