

1. EVIDENCE OF NEED

1.1. Program Information

1.1.1. Provide the name of the proposed program:

Bachelor of Science in Mechanical Engineering Technology

1.1.2. Provide the six-digit CIP code (format: XX.XXXX) of the proposed program, if known:

15.0805

1.1.3. Provide the names of the ATS, AAB, and/or AAS programs upon which the proposed program is intended to build.

Built on the existing AAS MET program.

1.2. Workforce Need and Other Program Availability

*1.2.1. Demonstrate that the proposed program meets the workforce need of regional business or industry in an in-demand field with long-term sustainability. Submit data from the Governor's Office of Workforce Transformation **as an appendix item.***

Looking at In-Demand Occupations from the Ohio Means Jobs web page, Appendix A, we have highlighted areas of direct relation as well as secondary relation. The occupations that would be of direct relation to graduates of our Bachelor of Science in Mechanical Engineering Technology program would be Mechanical Engineer, Manufacturing Engineer, and Validation Engineer. These three areas combine for an annual need of 812. Occupations that would be applicable to graduates with additional work experience would be Industrial Production Managers, Engineering Managers, and Sales Engineer. This secondary group has an annual need of 663.

Please see Appendix A.

*1.2.2. Provide a description that identifies the specific workforce need the program will address. Submit supporting data as **an appendix item.***

In reviewing the Q3 2017 EMSI data set for Richland and the nine surrounding counties for Mechanical Engineering, we can see 200 unique job postings for the first 8 months of 2017. In addition, while we understand there is a difference in engineering science and engineering technology the sample postings contained in the EMSI data Appendix B show what is typical in our area. The need for engineers in our area shows either science or technology being acceptable. With North Central State College having the option to offer a Bachelor of Science in Mechanical Engineering Technology, we will have the ability to impact this occupational need through three

pathways. First, we will recruit new students to the pipeline of mechanical engineering. Second, students who do well in our College Now Engineering program will have the option to continue in this program (see below). Finally, we will be positioned to up-skill existing associate level employees. These employees will have the opportunity to participate in a hands-on technical degree locally. Currently, students pursuing a bachelor's degree in the engineering field have to travel 70+ miles to participate in an applied program with hands-on activities, or they must participate in fully online programs that are not practical due to the lack of lab activities. The current environment does not provide a realistic option for students juggling work and family. The removal of 2+ hours of commute time helps remove one of the largest barriers for these busy students.

As briefly mentioned above, the addition of a Bachelor of Science in Mechanical Engineering Technology will provide a pathway for our College Now Engineering high school students. Our College Now program has a 14-year history of providing high school students the opportunity to graduate with an associate's degree in engineering technology concurrent with high school completion. This program has been graduating 20-25 students per year with the majority moving directly to a bachelor's degree program. The pairing of these programs will provide these students the opportunity to receive an engineering bachelor's degree within two years of high school graduation.

Please see Appendix B.

1.2.3. Describe the workforce gap that is not being met by existing bachelor's degrees at public and private universities. (Note: If bachelor's degrees exist that appear similar, please list them and identify how they do not meet the workforce needs).

Our local institutions, The Ohio State University at Mansfield and Ashland University do not offer bachelor pathways in engineering technology or bachelor level engineering sciences. While the University of Akron and the University of Toledo both offer engineering programs, Akron is more than 70 miles from the Kehoe Center while Toledo is more than 90 miles away. When looking at the workforce supply data from the Ohio.gov website, we can see that North Central State College sits in a region with few engineering graduates. Looking at the Northeast, Northwest, and Central regions one can see that there are no options for students looking for a Bachelor of Science in Mechanical Engineering Technology. There is no public or private institution offering a Bachelor of Science in Mechanical Engineering Technology within 70 miles. This limits the ability of working students to advance to a technical bachelor level, especially due to travel times and the need for lab/hands-on activities. From a geographic perspective, we can see from the mapping information found at <https://workforcesupply.chrr.ohio-state.edu/> in Appendix C, North Central State College could close the gap that exists in the center of the Northeast and Northwest regions as well as the north portion of the Central region.

Please see Appendix C.

2. INDUSTRY PARTNERSHIP

2.1. General Partnership Information: *To be approved to offer an applied bachelor's degree, the college must enter into an agreement with a regional business or industry to train students in an in-demand field and to employ students upon successful completion of a program.*

2.1.1. Provide the name of the regional business/industry partner for the proposed program:

The college has received tremendous support from local companies and institutions, especially the Regional Manufacturing Coalition including, Cooper Enterprises Inc., Gorman Rupp, Mansfield Engineered Products, MTD, Ohio Valley Manufacturing, Pioneer Career and Technology Center, Stoneridge, and Warren Rupp.

*2.1.2. Submit a copy of the agreement or of the expectations for the agreement **as an appendix item**. If an agreement will not be available until after approval by the chancellor, provide a letter from the potential partner that states key expectations to be in the agreement.*

Please see Appendix D that contains the letters of partnerships.

2.1.3. Describe employment opportunities with this business/industry partner after the student completes the program. Include the data points that will be collected to track employment outcomes.

Fifteen companies completed a survey conducted at the Richland County Regional Manufacturing Coalition's Oct. 20, 2017, Quarterly Meeting held at Gorman Rupp headquarters, see Appendix E. Eight companies described a need for 1-5 Mechanical Engineers in the next 5-10 years and nine companies described a need for 1-5 Mechanical Engineers in the next 3-10 years. Based on regional demographics, and similarities in the economic sectors, we expect similar needs, plus or minus, from the nearby counties including Ashland, Wayne, Crawford, and Morrow counties. These employment opportunities will be tracked after student graduation as we normally do with our current programs.

2.2. Workplace-Based Learning Experience

*2.2.1. Describe the workforce-based learning experience embedded in the program. Include commitments from business and industry partners **as an appendix item**.*

In collaboration with Ohio State University at Mansfield, North Central State College is engaged with an internship program to serve the needs of companies in the region. Between spring, 2013, and summer, 2017, more than 330 students were placed in

internships with more than 100 companies, with 25 of those internships in engineering. In Appendix F, we have provided the list of engineering related internships. Appendix F also contains an example of local company support for the expansion of the internships with the availability of bachelor level students.

Furthermore, North Central State College alone has had a range of 70 to 100 apprentices per year. The majority of these apprenticeships are in a technical discipline and take part in the engineering technology classes.

Please see Appendix F.

2.2.2. Describe the relationship of the individuals working with students in the workplace-based learning experience to those in the on-campus program (e.g., are they members of the on-campus faculty who also participate in the off-campus experience, or are they individuals employed by the off-campus facility who agree to supervise/mentor students)?

Mike Beebe is a current mechanical engineering technology instructor at North Central State College: While being a full-time Associate Professor, I have also maintained the role of Chief Technical Officer of Humanetics. Over the past 5 years, I have created different possible ways in which some of our students could work on projects with my employer, Humanetics. One method has been to hire the students for part-time work, which could be completed at North Central State College. Other projects have included both on- and off-campus work. One of these projects included the design of test fixtures and testing newly developed 3D printed internal crash dummy organs and comparing them to a porcine equivalent. One student has also been a summer intern. During the Right Signals grant, funded by the American Association of Community Colleges and Lumina Foundation, we have cultivated additional companies with which we are in the process of developing learning projects for our students.

North Central State College has a long history of strong interaction with local employers. For the Right Signals grant, we met with the Regional Manufacturing Coalition as well as a number of individual manufacturers to review job descriptions and help determine employee competency needs. Through the work with employers, we have identified additional competencies for current classes. An example of this is a currently running Engineering project class, which is using a modified employee review sheet from an employer's HR department to reinforce soft skills. The overall conclusion of the project has been that employers, faculty, and students benefit from a periodic review of job requirements to make certain all of us understand if the company job descriptions and the college's curriculum are supplying the current training solutions to meet the job requirements. The periodic review of job requirements is very important to maintain this alignment for our students and our employers.

The deeper understanding of competencies required and competencies gained from individual classes will help the employers and students connect. Some companies we have worked with, have revised job descriptions to better meet the true needs of

their workforce, so they can target recruitment down to the individual class. From the student perspective, we can share what competencies employers in our area are looking for and help the student see the real-world application of what they are learning.

Looking forward, North Central State College will continue interactions with employers and use the competency model to develop the pathways for students as they move forward, from certificate, to Associates, to Baccalaureate, and beyond.

2.2.3. Provide a description of the mechanisms used to measure the success of the workplace-based learning experience. Indicate how faculty members on the main campus are involved in monitoring and improving the experience.

North Central State College has a rich and vibrant history as a technical college which works closely with area companies. This includes the use of state-mandated advisory boards, as well as regular company visits for our students, faculty and administration. The Dean, Assistant Dean and Workforce Director, for instance, have visited well over 20 different companies this year alone, either to provide training, seek input on curriculum or projects, or simply to tour facilities.

This rich history includes a vibrant apprenticeship program serving such companies as Arcelor Mittal, Jay-Nanogate, MTD, Newman Tech, Ohio Valley Manufacturing, Gorman Rupp, Pepperidge Farm, PGW, JM Smucker's and many more. Though not required, we have taken the advisory board concept and applied it to our apprenticeship program, which has helped us consolidate classes, improve efficiencies and update our training equipment. Our work in this area was recently recognized by the Ohio Department of Job and Family Services as a community college partner subgrantee as a part of the U.S. Department of Labor's Apprenticeship USA State Expansion Grant award.

North Central State College is also a sub-awardee with The Center for Design and Manufacturing Excellence at The Ohio State University in Columbus, which is helping us develop a new polymer focused training program with Next-Generation Films and Jay-Nanogate as well as other polymer based manufacturers in our region. This work has featured NCSC faculty interaction with company engineers and trainers as well as travel to other schools in order to develop the right curriculum to meet our stakeholders' needs.

Not only do we ensure our curriculum meets employer needs through these mechanisms but we assure that our graduates are able to transfer smoothly to institutions to pursue Bachelor's Degrees, throughout Ohio and the Midwest. This year we have met in depth with faculty and administrators from Ohio State, Eastern Michigan University, the University of Toledo, and Miami University.

Faculty and staff are currently involved in local industry with our associate degree engineering programs and the addition of a bachelor's program would be a continuation of ongoing interactions. We would collaborate with manufacturers to build a "Project Advisory Board" for yearly review of engineering projects as well as

continuing to seek the input of our existing advisory groups to ensure that the competencies being delivered to our students are meeting employer needs.

3. INSTITUTIONAL CAPACITY

3.1. Describe the faculty capacity for the proposed program. Include numbers for existing faculty, and faculty that will be hired.

We would add one full-time masters-level engineering faculty member for the Bachelor of Science in Mechanical Engineering Technology program. We would also like to add a lab manager to oversee project quality across the curriculum. The new faculty member would work in conjunction with the current employees listed in Appendix G. One of these faculty members is starting a Master's Degree in Engineering in Spring 2018; the other is near completion of a Master of Science Engineering program. In addition, our president holds a Master's Degree in Engineering and is guiding this process; and our dean has considerable experience at educational institutions at the bachelor and graduate level. All of the general education faculty at North Central State College hold a minimum of a master's degree.

Please see Appendix G.

3.2. Describe the financial capacity for the proposed program.

After reaching a historic low reserve level of 6% in FY 2012, NC State has brought its reserves to the highest level in 10 years, close to 20% in FY 2016, and is internally projected to go to 31% for FY 2017. Over the past few years, the College has improved its composite score from 2.7 to 4.0 in FY 2016, and is internally projected to go to 4.5 in FY 2017. A copy of the financial ratios report for FY 2016 with North Central State College highlighted is in Appendix H.

3.3. Describe the facilities and equipment capacity for the proposed program.

The program will be located at the Kehoe Center for Advanced Learning. It is a Center of Excellence, versatile spaces that support innovative learning environments, which accomplish multiple initiatives in education, workforce training and economic development, all under one roof. We believe the Kehoe Center is unique in the region and worthy of being recognized as a facility which aspires to showcase best practices in engineering education when compared both statewide and nationally. These innovative programs and facilities include:

1. The education pathway going from dual enrollment in business and in engineering in collaboration with Pioneer Career and Technology Center (where students finish their associate degree before their high school diplomas at no cost to them), to associate degrees in business and entrepreneurship and engineering from the College, to baccalaureate degrees with Franklin and Miami universities.

2. The stackable credentials pathways from the Industrial Readiness Training (through the U.S. DOL TAACCCT III grant) for basic entry into industry to certificate and associate degrees using the Right Signals stackable certificate program in collaboration with the American Association of Community Colleges and Lumina Foundation mapping knowledge and skills through different levels of credentials that can be recognized by industry regionally and nationally
3. The internship program in order to prevent the students from getting caught up in the vicious cycle of not being able to find a job because they don't have experience, and not have experience because they don't have a job. As stated previously, we have worked very closely with OSU-Mansfield on this internship program to serve the region.
4. Annually, we have between 70 and 100 apprentices with area companies (noted above). The College is finalizing its status as a Registered Apprenticeship Sponsor and as noted above is a grant recipient with Ohio Department of Job and Family Services for this year. Apprentice partners include:
 - Arcelor Mittal
 - Breitinger Company
 - Cole Tooling and Stamping
 - Hess Industries
 - Jay-Nanogate
 - Lake Park Industries
 - Minnich Manufacturing
 - MTD Willard
 - Newman Technology
 - Ohio Valley Manufacturing
 - Shelby Tube
5. The Integrated System Technology (IST) Lab (with hydraulic, pneumatic, and system controls) and advanced manufacturing in Computer Numerical Control, automation, robotics and a complete 9-station mechatronics unit.
6. A fabrication lab with 3-D printing capabilities and the Advanced Manufacturing Tool and Die Center that allows companies to design, prototype, and build their own products
7. The learning and communication center with a smart classroom and high tech global video conferencing

The Kehoe Center allows North Central State College to provide students hands-on engineering and manufacturing experience more than adequate for all aspects of the Bachelor of Science in Mechanical Engineering Technology. With \$3,887,557 in local, state, and federal grants since 2013, the center houses some of the latest equipment in robotics, metrology, prototyping, and manufacturing automation including physics instructional lab and equipment, materials lab, robotics lab, welding, tool and die facility with manual and CNC machining. A photo sample of these facilities is shown in Appendix I.

3.4. *In addition to allowable tuition, will additional program fees be required for students in the proposed program? If so, please describe.*

There would not be the need for additional program fees outside of the current fee structure for our existing associate level engineering coursework. These fees are used for lab materials and student project needs. In years 3 and 4, the tuition will be 1.5 times that of the associate degree, with tuition remaining the same for baccalaureate students in years 1 and 2 as it is for associate degree students.

3.5. Please provide a budget that addresses the up-front investment required to establish the proposed program.

Other than new faculty member and partial support from the program revenue to support a lab/project manager, cost should be low because we will be able to utilize much of the existing equipment in the associate program.

3.6. Please provide revenue and expense information that tracks how many years it will take for revenue derived from the program to exceed program expenses.

Below we have laid out the first year startup approximation for the Bachelor of Science in Mechanical Engineering Technology program.

Start-up cost projection		\$213,000.00
	\$10,000.00 HLC program approval	
	\$45,000.00 Curriculum development	
	\$98,000.00 Engineering Faculty	
	\$60,000.00 Engineering lab/project manager	

Next is the continuing year-to-year cost estimates.

Yearly cost projection		\$175,000.00
	\$98,000.00 Engineering Faculty	
	\$60,000.00 Engineering lab/project manager	
	\$10,000.00 Internship travel, professional development	
	\$3,000.00 Accreditation	
	\$3,000.00 Tutoring	
	\$1,000.00 Student club	

As we have discussed earlier in this document we feel that North Central State College has a number of feeding pathways to a Bachelor of Science in Mechanical Engineering Technology program (new students, current associate degree graduates, alumni, and company employees). As such, we feel that 15-20 students entering the bachelor program from the different sources is very feasible. However, in our analysis below, we are conservatively estimating, that even with 12-15 students starting per year, including potential attrition, a profitable year three of program operation is very likely.

Breakeven projection				
Fiscal year	2019	2020	2021	2022
Entering cohort	12	12	15	15
Year 2		10	12	12
Year 3			10	10
Completing				8
Total # of students	12	22	37	45
Income	\$60,120.00	\$110,220.00	\$231,435.00	\$281,475.00

4. Appendices

- 4.1. Appendix A: In-Demand Occupations from the Ohio Means Jobs web page
- 4.2. Appendix B: EMSI Data
- 4.3. Appendix C: Workforce Supply
- 4.4. Appendix D: Employer Letters
- 4.5. Appendix E: Employer Survey
- 4.6. Appendix F: Internship Information
- 4.7. Appendix G: Employee Information
- 4.8. Appendix H: Financial Ratio
- 4.9. Appendix I: Facilities Photo Sample