KENT STATE UNIVERSITY
CERTIFICATION OF CURRICULUM PROPOSAL

Preparation Date **17-Oct-17** Curriculum Bulletin _____

Effective Date **Fall 2018** Approved by EPC _____

Department	**Applied Engineering**		
College	**AR - Aeronautics and Engineering**		
Degree	**BS - Bachelor of Science**		
Program Name	**Mechanical Engineering Technology**	Program Banner Code	**MERT**
Concentration(s)	**Mechanical Engineering Technology**	Concentration(s) Banner Code(s)	**MERT**
Proposal	**Establish program**		

Description of proposal:

The college of Aeronautics and Engineering is seeking approval to establish a Bachelor of Science Degree in Mechanical Engineering Technology. This new program is based on the existing Mechanical Engineering Technology concentration under the Bachelor of Science in Applied Engineering program.The purpose of this change is to create a program that is relevant and responsive to industry needs. The mechanical engineering technology curriculum has developed to the point where it no longer shares 50% of its major courses with the other Applied Engineering concentrations and is out of compliance in regards to concentration content within a major.

Does proposed revision change program's total credit hours? ☐ Yes ☒ No

Current total credit hours: **120** Proposed total credit hours **120**

Describe impact on other programs, policies or procedures (e.g., duplication issues; enrollment and staffing considerations; need; audience; prerequisites; teacher education licensure):

There is no immediate additional need for lab space for the proposed program.

Units consulted (other departments, programs or campuses affected by this proposal):

Kent State Tusc campus.

REQUIRED ENDORSEMENTS

Jackie Bullers — 10/24/17

Department Chair / School Director

_____ — ___/___/___

Campus Dean (for Regional Campuses proposals)

Robert G. Smith — 10/26/2017

College Dean (or designee)

_____ — ___/___/___

Dean of Graduate Studies (for graduate proposals)

_____ — ___/___/___

Senior Vice President for Academic Affairs and Provost (or designee)

HIGHER LEARNING COMMISSION

FORM

New Programs

Substantive Change Application

Institution: Kent State University City, State: Kent, Ohio

Name of person completing this application: Therese E. Tillett

Title: Executive Director, Curriculum Services Phone: 330-672-8558 Email: ttillet1@kent.edu

Date Submitted:

The questions are designed to elicit brief, succinct, detailed information, rather than a narrative or references to extensive supporting documents. Do not attach other documents unless they are specifically requested in the questions and are germane to the request. The total submission should be no more than 10–12 pages on a single classification of change. (The page limit excludes attachments. However, the overall length, including attachments, should not exceed 200 pages.)

If the person completing this application is not the CEO, CAO or the ALO of the institution, it is understood that the person completing and submitting this application has consulted with and informed those individuals.

Please note: HLC plans to update the change forms annually, on or about September 1 of each year. However, if a change application form was accessed more than 90 days prior to filing, it is recommended that the institution visit http://www.hlcommission.org/change to ensure that there have been no changes to the application form in the intervening time.

Submit the completed application as a single PDF file on the following webpage: http://www.hlcommission.org/document_upload/.

Part 1: General Questions

1. **Requested Change(s).** Concisely describe the change for which the institution is seeking approval.

   Kent State University proposes to offer a Bachelor of Science degree in Mechanical Engineering Technology to be offered through the university's College of Aeronautics and Engineering. This program is existing as a concentration within the college's Applied Engineering major. The goal is to elevate the concentration to a separate major and align the curriculum more fully with accreditation standards.

Kent State's Applied Engineering major is accredited by the Association of Technology, Management, and Applied Engineering (ATMAE). With the proposed Mechanical Engineering Technology major, the university will seek accreditation for the degree program from the Engineering Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET).

2. **Is this application being submitted in conjunction with another application?**

☐ Yes

☒ No

3. **Classification of Change Request.**
Note: not every institutional change requires prior review and approval. Review the "Overview of HLC Policies and Procedures for Institutional Changes Requiring HLC Notification or Approval" to make certain that current HLC policy requires the institution to seek approval.

New academic program(s):

☐ Certificate ☒ Bachelor's ☐ Diploma ☐ Master's/specialist

☐ Associate's ☐ Doctorate ☐ *Check if program is at a new degree level*

An institution submitting more than one change request should complete multiple applications, one for each type of change. The types of change requests include:

- Change in mission
- Change in student body
- Competency-based education (credit-based; direct assessment; hybrid) programs
- Consortial arrangement
- Contractual arrangement
- Substantially changing the clock or credit hours required for a program
- Change in academic calendar (e.g., quarters to semester) or change in credit allocation
- Teach-out plan if closing location provides total degree programs
- Distance or correspondence education
- New programs
- Certificate programs
- Branch campuses and additional locations

4. **Special conditions.** Indicate whether any of the conditions identified below fit the institution (Yes or No). If Yes, explain the situation in the space provided.

a) Is the institution, in its relations with other regional, specialized, or national accrediting agencies, currently under or recommended for a negative status or action (e.g., withdrawal, probation, sanction, warning, show-cause, etc.)?

No.

b) Is the institution now undergoing or facing substantial monitoring, special review, or financial restrictions from the U.S. Deptartment of Education or other federal or state government agencies?

No.

c) Has the institution's senior leadership or board membership experienced substantial resignations or removals in the past year?

No.

d) Is the institution experiencing financial difficulty through such conditions as a currently declared state of exigency, a deficit of 10% or more, a default or failure to make payroll during the past year, or consecutive deficits in the two most recent years?

No.

e) Is the institution experiencing other pressures that might affect its ability to carry out the proposal (e.g., a collective bargaining dispute or a significant lawsuit)?

No.

5. **Approvals.** Mark whether each type of approval is required prior to implementing the proposed change. If "Yes," attach documentation of the approval to the request. If "No," attach evidence that approval is not needed.

Internal (faculty, board) approvals	☒ Yes	☐ No	
System approvals	☐ Yes	☐ No	☒ Not Applicable
State approval	☒ Yes	☐ No	
Foreign country(ies) approvals	☐ Yes	☐ No	☒ Not Applicable
For Distance or Correspondence Education only: Process in place to ascertain and secure state approval(s) as required	☐ Yes	☐ No	

6. **Specialized Accreditation.** Complete this section only if specialized accreditation is required for licensure or practice in program(s) covered by this change application.

☐ The institution has already obtained the appropriate specialized accreditation. Attach a copy of the letter from the agency granting accreditation.

☐ The institution has begun the process of seeking or plans to seek specialized accreditation. Specify the name of the agency and the timeline for completing the process in the space below. (If approval is a multi-stage process, the institution should contact the HLC staff liaison to discuss the timeline before submitting this change application form.)

☐ The institution does not plan to seek specialized accreditation. Provide a rationale for not seeking this accreditation in the space below.

7. **Changes Requiring Visits.** This section is not for HLC-mandated visits such as additional location confirmation visits or campus evaluation visits.

Note: Complete this section only if the institution is already aware that the proposed change will need to be reviewed through a visit. The institution may submit Part 1 of the change request application to begin the process of scheduling a Change Visit or adding the proposed change to an already scheduled visit. The full application must be submitted at a later date. (If the institution is unsure

whether a visit is required, leave this section blank and submit the full change application. HLC will advise the institution based on the information provided.)

a) Select the type of visit the institution is requesting:

☐ Request to schedule a Change Visit.

Change Visits typically are scheduled approximately four months from the date an institution submits its change request. The full change application and other required materials will be due to HLC and the peer review team eight weeks before the visit date. See http://www.hlcommission.org/change-visit for more information.

☐ Request to add a proposed change to an already scheduled visit. **Note:** Such requests must be submitted at least six months before the visit date.

Specify type of visit and date scheduled:

The institution's full change application should be submitted along with other materials required for the visit.

b) Provide URLs to the institution's Faculty/Staff Handbook and Catalog below. If the URLs are not available, please provide PDF versions of these documents when submitting other required materials prior to the visit.

Faculty/Staff Handbook URL:

Catalog URL:

Part 2: Topic-Specific Questions

An institution should submit a separate application for each requested program (unless the programs represent closely related disciplines). If more than one program is being requested in this application, please be sure to sufficiently address each program when answering the following questions, particularly in Sections A, D, E and F. Each proposed new program should be identified by using the *Classification of Instructional Programs* terminology (CIP codes). CIP codes are established by the U.S. Department of Education's National Center for Education Statistics as a taxonomic scheme that supports the accurate tracking and reporting of fields of study and program completions activity. More information is available at http://nces.ed.gov/ipeds/cipcode/.

Attach the "Substantive Change Application, Part 1: General Questions" as page one of your application. That completed form and your answers to the questions below will constitute your request for approval of a substantive change. This form will be the basis for review of this application.

Section A. Characteristics of the Change Requested

1. Identify the basic characteristics of the proposed educational program as indicated below:

a) The full name of the proposed program, the specific degree (if applicable) or the instructional level (if not a degree program), and the six-digit CIP code XX.XXXX of the program (CIP codes, program name, and additional description [optional])

The name of the program will be the Mechanical Engineering Technology major within the Bachelor of Science degree. The CIP most aligned with the program's outcomes is the following:

15.0805 Mechanical Engineering/Mechanical Technology/Technician. A program that prepares individuals to apply basic engineering principles and technical skills in support of engineers engaged in the design and development phases of a wide variety of projects involving mechanical systems. Includes instruction in principles of mechanics, applications to specific engineering systems, design testing procedures, prototype and operational testing and inspection procedures, manufacturing system-testing procedures, test equipment operation and maintenance, and report preparation.

b) Total credit hours (indicate whether semester or quarter) for completion of the program

The Mechanical Engineering Technology major is 120 semester credit hours, comprising 67 credit hours of major coursework and 53 credit hours of mathematics, chemistry, physics, business and general education coursework.

c) Normal or typical length of time for students to complete the program

Full-time new students will be able to complete the program in four years (eight semesters).

d) Proposed initial date for implementation of the program

Fall 2018 Semester.

e) Primary target audience for the program (e.g., full-time, part-time, traditional college age, working adults, transfer students, military personnel, or particular ethnic group)

The target audience is full-time and part-time traditional students and students transferring from another institution.

f) Projected life of the program (single cohort or ongoing)

The program will have ongoing admission.

g) Whether the program will be part of contractual or consortial arrangement

Not applicable.

2. Identify if the institution is requesting new stipulations for the proposed program and provide a rationale for this request.

Not applicable.

3. If the institution is planning any involvement by external organizations (other than accredited higher education institutions) in key operations as identified below, provide the information requested below and complete the Contractual Screening Form for each planned involvement. (Note that such involvement by a parent company or by one of its subsidiaries external to the institution in any of these operations should be reported.) If the screening form indicates contractual approval is required, complete the full contractual application and submit it in conjunction with the program application. If the screening form indicates no further action is required, attach the confirmation email from HLC.

Type of Involvement	Name(s) of External Organization(s)	Percent of Involvement
A. Recruitment and admission of students	Not applicable	Not applicable
B. Course placement and advising of students	Not applicable	Not applicable
C. Design and oversight of curriculum	Not applicable	Not applicable
D. Direct instruction and oversight	Not applicable	Not applicable
E. Other support for delivery of instruction	Not applicable	Not applicable

Section B. Institution's History With Programs

4. Does the institution currently offer a program at the same instructional level and with the same 4-digit CIP code (XX.XX) as the proposed program? If so, identify the program currently offered and whether it is a degree program. Will the proposed program replace the program currently offered?

Kent State offers one bachelor's degree major—Aeronautical Systems Engineering Technology—in the same four-digit CIP series (15.08 Mechanical Engineering Related Technologies/Technicians). The proposed program will not replace the existing program.

5. Does the institution currently offer two or more programs at the same instructional level with the same 2-digit CIP code (XX.) as the proposed program? If so, identify the two such programs with the highest numbers of graduates during the past year, along with their numbers of graduates.

Kent State offers two bachelor's degree majors with the same two-digit series (15 Engineering Technologies and Engineering-Related Fields.).

- Aeronautical Systems Engineering Technology major: first cohort of 22 students entered in fall semester 2017
- Engineering Technology major: 37 graduates in fiscal year 2017

Section C. Institutional Planning for Program Change

6. What impact might the proposed program have on challenges identified as part of or subsequent to the last HLC review and how has the institution addressed the challenges?

There are no identified challenges.

7. Briefly describe the planning process for determining the need for this new program, including the role of faculty in the planning and approval process.

The College of Aeronautics and Engineering has offered this program since 2013 as one of four concentrations in the Applied Engineering major, Bachelor of Science degree. In its four years, the program has grown eightfold in enrollment, with 142 students in fall 2017.

The Applied Engineering major is accredited by the Association of Technology, Management and Applied Engineering (ATMAE). The college will seek to have the proposed Mechanical Engineering Technology accredited, instead, by ABET. With different curriculum, learning outcomes and accreditation standards, the Applied Engineering and Mechanical Engineering Technology programs have gone down separate paths and now need to be made separate degree programs

[Future Actions] In addition to be approved by the applied engineering faculty, the proposal was approved by the faculty-led Aeronautics and Engineering Curriculum Committee, the Educational Policies Council, a subcommittee of the Faculty Senate; and the Faculty Senate.

8. What are the physical facilities and equipment needed to support the program? Indicate the impact that the proposed change will have on the physical resources and laboratories that currently accommodate existing programs and services, or identify new laboratory and preceptor needs.

As the program is existing, facilities on the Kent Campus will be adequate for the elevation of the concentration to major. In 2015, a new, 55,000-square-foot aeronautics and technology building opened on the Kent Campus. The building houses classrooms and laboratories to support the College of Aeronautics and Engineering programs, including an advanced Mechanical laboratory, a magnethermic casting laboratory and an air traffic control simulation laboratory.

9. What is the evidence that a market for the new program(s) exists? How has estimated program demand been factored into realistic enrollment projections? How has this evidence been used in planning and budgeting processes to develop a quality program that can be sustained?

A recent Gallup study found that "approximately 2.7 million jobs (22 percent of existing workforce) will be retiring from the manufacturing workforce between now and 2025. The U.S. manufacturing industry will add nearly 3.4 million jobs in the next decade to meet both future domestic and international demand. Moreover, as manufacturing firms expand their operations over this 10-year period, they will need an additional 700,000 workers to meet the demand."[2]

According to the Ohio Manufacturers' Association, the Ohio manufacturing sector was fourth in the nation and has 5.6 percent of manufacturing jobs in the United States.[3] Using 2.7 million jobs as the base, this means Ohio must replace approximately 151,000 workers.

[1] Manufacturing Institute (2015). T*he Skills Gap in the U.S. Manufacturing 2015 and Beyond*. Retrieved from www.themanufacturinginstitute.org/~/media/827DBC76533942679A15EF7067A704CD.ashx.

[2] The Ohio Manufacturers' Association (2015). *2015 Ohio Manufacturing Counts*. Retrieved from www.ohiomfg.com/wp-content/uploads/ManufacturingCounts2015.pdf.

10. If the program request is approved, what future growth do you anticipate (e.g., in the next six months, three years) and how do you plan to manage this growth?

Using past enrollment growth in the concentration as a basis (see table below), future enrollment is projected at the same rate. With the concentration becoming a separate degree program, Kent State expects that the program will become more visible to prospective students.

Table: Student Enrollment in the Mechanical Engineering Technology Concentration, Applied Engineering Major

Fall 2013	Fall 2014	Fall 2015	Fall 2016	Fall 2017
10	54	102	120	142

The college has the resources to manage the program currently, but as the program continues to grow as expected, it will be necessary to hire additional faculty. It is anticipated that the enrollment in the next six months will be approximately 150 students and will stabilize at 200 students in three years. The program will require one additional full-time faculty member when enrollment reaches 170.

11. How does this program fit into the current and expected financial picture of the institution? In particular, will the program be financially self-sufficient within three years? If not, when do you expect the program to be financially self-sufficient and how do you expect the program to operate until then?

Kent State University operates under a Responsibility Center Management-based (RCM) financial model, where business-type strategies are used to manage and evaluate new and existing programs. Under this model, costs and revenues are taken into consideration when making decisions about the viability of programs. The proposed Mechanical Engineering Technology major will be no exception, and will undergo the same scrutiny as other.

The proposed degree program is existing, albeit as a concentration within the Applied Engineering major. Only two new courses will be added to the curriculum. Therefore, the program can rely on existing faculty, facilities, library resources, equipment and technology (with minor upgrades).

Fiscal projections show the program breaking even in year two of implementation, and then show a net gain after that. Since the program will be launched using existing facilities, equipment and faculty, investments that must be made in year one will be modest and absorbed using college revenue from other programs.

12. What controls are in place to ensure that the information presented to all constituencies in advertising, brochures, and other communications will be accurate?

The Office of the Provost ensures that only faculty- and university-approved program information is included in the university's Catalog, degree audit, Explore Programs and Degrees website and student information system (for admission and graduation). Kent State's Division of University Communications and Marketing coordinates branding and consistency of all of the university's promotional materials.

Section D. Curriculum and Instructional Design

13. Please list all the courses that comprise the program and identify if the program will include any new courses. Include course descriptions and number of credit hours for each.

MAJOR REQUIREMENTS

TECH 13580 Engineering Graphics I 3 Credit Hours
Technique of engineering drawing, lettering, instrument use, freehand drawing, orthogonal projection, sections, single and double auxiliaries, dimensioning, screw threads, charts and graphs.

TECH 20001 Energy/Power 3 Credit Hours
Study of basic thermodynamic laws and how they apply to the conversion and transfer of heat energy into useful power.

TECH 20002 Materials and Processes 3 Credit Hours
Study and practice addressing the nature of basic manufacturing materials and the processes by which they are converted into manufactured products. Includes laboratory experience.

TECH 21021 Survey of Electricity and Electronics 4 Credit Hours
Survey of DC and AC circuits, semiconductors, and electronic devices, including diodes and transistors.

TECH 23581 Computer-Aided Engineering Graphics 3 Credit Hours
Study of working drawings, descriptive geometry, geometrical tolerancing, structural/weldments, cams, gears, piping and considerable time with the Hewlett Packard 900 CAD system.

TECH 26010 Introduction to Computer Engineering Technology 3 Credit Hours
Describes Computer Engineering Technology concepts and principles. Topics include computer hardware, computer hardware operations, digital systems design, networking hardware, technology of networking, computer aided design and embedded systems.

TECH 26200 Programming for Engineering I 3 Credit Hours **NEW**
Introduction to engineering problem solving and use of programming language to solve those problems is the base of this course. Students in an engineering major are expected to develop basic mathematical modeling and engineering problem solving skills using mathematical and conventional computational tools. Developing modeling and logical thinking are the core objective of this course.

TECH 31000 Cultural Dynamics of Technology 3 Credit Hours
Study of technology and the forces it exerts upon society.

TECH 33031 Programmable Logic Controllers 3 Credit Hours
An introduction to programmable logic controllers (PLCS) covering hardware, ladder logic programming, networking and communications. Programming timers, counters and sequencers and an introduction to human machine interfaces (HMIS).

TECH 33033 Hydraulics/Pneumatics 3 Credit Hours
Fluid properties, hydraulic design, viscosity, hydraulic components, pumps, systems and circuits, maintenance and safety, pneumatics, air systems control and design.

TECH 33111 Strength of Materials 3 Credit Hours
An analytical study of the relation between the external forces applied to elastic materials and the resulting deformations and stresses.

TECH 33363 Metallurgy and Materials Science 3 Credit Hours
Scientific study of modern manufacturing materials (metals, plastics and ceramics) and the laboratory test methods used to determine their manufacturing specifications and properties.

TECH 34002 Advanced Computer-Aided Design 3 Credit Hours
Continuation of CADT 22000 with an emphasis on the use of a Parametric-based CAD software (PRO-ENGINEER) for the design and modeling of industrial products.

TECH 36200 Programming for Engineering II 3 Credit Hours **NEW**
Emphasizes engineering problems and applications of programming language and mathematical tools to analyze and solve them. Students with engineering major (including Mechanical, mechanical engineering technology and computer engineering technology) are expected to learn problem solving techniques, modeling, simulation and presentation of engineering application oriented problems using conventional computation and mathematical tools. Advanced modeling, simulations and analysis are the core objectives of this course.

TECH 43080 Industrial and Environmental Safety 3 Credit Hours
Examines the occupational safety and health act and fundamentals of industrial safety programs.

TECH 43550 Computer-Aided Manufacturing 3 Credit Hours
The application of computers to the preparation of machine tool control programs.

TECH 43580 Computer-Aided Machine Design 3 Credit Hours
Description and Prerequisite Data Currently in Banner: Application of the principles of mechanics and strength of materials, with computer assistance to the design and selection of machine components under both static and dynamic loads.

TECH 43800 Applied Engineering Technology Seminar 3 Credit Hours
As the capstone course in Applied Engineering, students will develop and participate in all aspects of a project involving the solution of a problem through application of technology. Students must pass the ATMAE Certified Technical Manager (CTM) exam.

MAJOR ELECTIVES

TECH 31065 Cast Metals 3 Credit Hours
Principles and processes of metal casting with a focus on current industrial practices. Includes laboratory experience with nonferrous metals and industrial tours.

TECH 33040 Motors and Controllers 3 Credit Hours
AC and DC motors, motor control, and machine operations in mechatronic systems. Includes introduction to basic control system terms and devices, input and output transducers, signal conditioning, open loop and closed loop control, stability and performance.

TECH 36620 Project Management in Engineering and Technology 3 Credit Hours
The planning, organizing, directing, and controlling of company technology resources for project-based management functions. Includes project coordination requirements, management and planning methods and the use of various management and planning tools.

TECH 43030 Mechatronics 3 Credit Hours
Application of automation concepts in motion control, electrical circuits, fundamental mechanics, control systems and programming including modeling, interfacing and signal conditioning.

TECH 43031 Mechatronics II 3 Credit Hours
Advanced modeling, system response, closed loop control and system software for mechatronic systems.

TECH 43096 Individual Investigation in Applied Science and Technology 1-3 Credit Hours
(Repeatable for credit) Work study of an individual nature on a topic in a field of applied science and technology.

TECH 43700 Computer Integrated Manufacturing 3 Credit Hours
Study of the computer integrated manufacturing system as it relates to product design, estimating inventory, machining and assembly, quality control and distribution.

TECH 47200 Systems Engineering 3 Credit Hours
Systems engineering as a method to solve problems. Introduction to the fundamental systems engineering principles, processes, and methodologies used to analyze, design, develop, and deploy complex, sustainable systems. Focuses on systems engineering as a logical, disciplined, systematic, and coherent approach to the design and development of a system, across the full life cycle of the system. Special emphasis is made on the concepts, methods, and activities used to analyze systems, to define and allocate requirements, to transform requirements into a system design, and to verify and validate the system.

TECH 47210 Sustainable Energy I 3 Credit Hours
A comprehensive overview of energy sources and energy systems, with an emphasis on renewable energy and the implementation and sustainability of various forms of energy. Examines the characteristics of conventional non-renewable energy systems, along with alternate, renewable energy sources and systems. Includes fundamental energy concepts and the conversion, delivery, distribution, and storage of energy. Explores the technological application of various sources of energy and compares their benefits and limitations. Also presents an overview of present U.S. and global energy needs and demands, and the sustainable energy technologies that may be used to meet future energy demands.

TECH 47211 Sustainable Energy II 3 Credit Hours
An in-depth study of the analysis, selection, and implementation of various energy and power sources, with an emphasis on the use of renewable, sustainable energy systems. Focuses on determining energy needs, and on assessing and comparing energy systems with respect to efficiency, technical feasibility, available resources, cost and sustainability characteristics. Includes economics of energy systems, methods for determining costs, and cost-benefit analysis of various energy and power systems. Also includes the social, economic and environmental impact associated with the development, implementation and use of various forms of energy.

ADDITIONAL REQUIREMENTS

ACCT 23020 Introduction to Financial Accounting 3 Credit Hours
Introduction to the basic concepts and standards underlying financial accounting. Topics to be covered include revenue recognition, receivables, inventory, long-lived assets, liabilities and stockholders' equity. The impact of transactions on the accounting equation and financial statements (balance sheet, income statement and cash flows) is emphasized.

CHEM 10050 Fundamentals of Chemistry 3 Credit Hours
Basic concepts of chemistry (including atomic structure, chemical bonding and reactions) necessary for courses in elementary organic chemistry and physiological chemistry.

COMM 15000 Introduction to Human Communication 3 Credit Hours
An inquiry into the nature and function of human communication in interpersonal, group and public contexts.

ECON 22060 Principles of Microeconomics 3 Credit Hours
Course covers principles and policies affecting prices, including factor incomes, under alternative market structures. Students develop tools to examine social problems, including poverty, crime, pollution and international relations.

ENG 20002 Introduction to Technical Writing 3 Credit Hours
Introduction to communication practices within technical communities. Planning, drafting, revising and editing. Process descriptions, object descriptions, instructional texts, technical correspondence, problem reports, critical reflection.

MATH 11022 Trigonometry 3 Credit Hours
Solution of triangles, trigonometric equations and identities.

MATH 12002 Analytic Geometry and Calculus I 5 Credit Hours
Concepts of limit, continuity and derivative, and the indefinite and definite integral for functions of one real variable. Maximization, related rates, fundamental theorem of calculus.

PHY 13001 General College Physics I 4 Credit Hours
Principles of mechanics, heat and sound.

PHY 13002 General College Physics II 4 Credit Hours
Principles of electricity and magnetism, optics and modern physics.

PHY 13021 General College Physics Laboratory I 1 Credit Hour
Introductory lab to accompany PHY 13001 or PHY 13011.

PHY 13022 General College Physics Laboratory II 1 Credit Hour
Introductory lab to accompany PHY 13002 or PHY 13012.

UC 10097 Destination Kent State: First Year Experience 1 Credit Hour
(Equivalent to UC 10002 or UC 20007) Course assists students in making a successful academic transition to the university through experiential or intellectually engaging discipline-based content. Required of all first year students. Not required of transfer students with 25 or more credit hours.

14. What are the requirements students must fulfill to complete the program successfully (including specific courses, course options, and any other requirements)?

Major Requirements		
TECH 13580	Engineering Graphics I	3
TECH 20001	Energy/Power	3
TECH 20002	Materials and Processes	3
TECH 21021	Survey of Electricity and Electronics	4
TECH 23581	Computer-Aided Engineering Graphics	3
TECH 26010	Introduction to Computer Engineering Technology	3
TECH 26200	Programming for Engineers I (NEW)	3
TECH 31000	Cultural Dynamics of Technology	3
TECH 33031	Programmable Logic Controllers	3
TECH 33033	Hydraulics/Pneumatics	3
TECH 33111	Strength of Materials	3
TECH 33363	Metallurgy and Materials Science	3
TECH 34002	Advanced Computer-Aided Design II	3
TECH 36200	Programming for Engineers II (NEW)	3
TECH 43080	Industrial and Environmental Safety	3
TECH 43550	Computer-Aided Manufacturing	3
TECH 43580	Computer-Aided Machine Design	3
TECH 43800	Applied Engineering Technology Seminar	3
		12

Technical Electives, choose from the following:

TECH 31065	Cast Metals
or TECH 36620	Project Management in Engineering and Technology
TECH 33040	Motors and Controllers
TECH 43030	Mechatronics
TECH 43031	Mechatronics II
TECH 43096	Individual Investigation in Applied Science and Technology
TECH 43700	Computer Integrated Manufacturing
TECH 47200	Systems Engineering
TECH 47210	Sustainable Energy I
TECH 47211	Sustainable Energy II

Additional Requirements		
ACCT 23020	Introduction to Financial Accounting	3
CHEM 10050	Fundamentals of Chemistry	3
COMM 15000	Introduction to Human Communication	3
ECON 22060	Principles of Microeconomics	3
ENG 20002	Introduction to Technical Writing	3
MATH 11022	Trigonometry	3
MATH 12002	Analytic Geometry and Calculus I	5
PHY 13001	General College Physics I	4
PHY 13002	General College Physics II	4
PHY 13021	General College Physics Laboratory I	1
PHY 13022	General College Physics Laboratory II	1
UC 10097	Destination Kent State First Year Experience	1
Kent Core Composition		6
Kent Core Humanities and Fine Arts (minimum one course from each)		9
Kent Core Social Sciences (must be from two disciplines)		3
General Elective (total credit hours depends on earning 120 credit hours, including 39 upper-division credit hours		1
	Minimum Total Credit Hours:	**120**

15. For programs using prior learning credit, compressed time frames, online delivery, accelerated formats or other approaches to learning, explain how the institution will ensure that student work and the levels of knowledge and competencies comparable to those required in traditional formats have been achieved.

Kent State University has partnered with several secondary school districts and career and technical centers to accept for college credit completion of tech prep education programs in engineering and engineering technology. All tech prep programs in Ohio are required to align with the technical content standards and curriculum as developed by both high school and college faculty and business and industry representatives. Thus, the competencies are the same for all programs in a particular career field state-wide. All students are tested using the same state-wide end-of-course exams, which were developed in collaboration by high school and college faculty.

Section E. Institutional Staffing, Faculty, and Student Support

16. How many and what types of faculty (full-time or part-time) will be employed in the program? Why is the number and type of faculty sufficient to support the program? How many, if any, new faculty will be hired for the program?

Existing four full- and seven part-time faculty in the College of Aeronautics and Engineering teach the major courses in the program. Faculty-to-student ratio is presently one full-time faculty for every 32 full-time equivalent students (headcount calculations).

17. What will the impact of the new initiative be on faculty workload?

    There will be no impact on the faculty workload.

18. Provide a brief attachment that inventories each faculty member employed to teach in the program, including names of existing personnel, a description of each faculty member's academic qualifications, their prior instructional responsibility and other experiences relevant to the courses they will teach in the program in question, each faculty member's course load in the new program, and the course work each teaches in other programs currently offered. (Note: Do not attach full CVs for each faculty member; rather, the requested information should be summarized in one paragraph for each faculty member.)

    See Appendix A.

19. For graduate programs, document scholarship and research capability of each faculty member; for doctoral programs, document faculty experience in directing student research.

    Not applicable.

20. What library and information resources—general as well as specific to the program(s)—and staffing and services are in place to support the initiative? If the proposed new program is at the graduate level, document discipline-specific refereed journals and primary source materials.

    Kent State's science librarian, determined whether the collection of print and electronic resources where adequate enough to support the program proposed. The science librarian works closely with the library representative from the college to determine the need for additional resources as needed, and fulfills direct requests from faculty in need of additional resources. There is an annual budget allocated by the library and administered by the science librarian to support the resource needs of the college. In addition, the science librarian teaches information literacy classes that focus on the usage of these materials.

    Book collections: The existing book collection at the Kent State University Library will strongly support the proposed areas of study and research. Existing services the library offers will allow for continued development of this collection. Faculty members have the ability to participate in the selection of new books and journals for the collection. The University Library allocates an annual budget for monograph and journal purchases for the College of Aeronautics and Engineering. The science librarian coordinates requests for these purchases. In addition, for materials not available in the collection, faculty and students may request books through the Interlibrary Loan system.

    Journals and subscriptions: Another area of collection support is the University Library's collection of academic periodicals. This collection of journals supports most of the needs of faculty and students research. The collection management librarian and science librarian regularly review interlibrary loan reports from collage to identify new collection needs.

    Database collection: The University Library provides access to several databases. The database collection is evaluated each year to ascertain its usefulness to faculty and students, when to acquire new databases, and replace those not of use.

    - ACM Digital Library: Provides bibliographic information, abstracts, index terms, reviews and the full-text for ACM conference proceedings. ACM journals, magazines and newsletters are also available at this site, as well as through the OhioLINK Electronic Journal Center.

- AccessScience: An online encyclopedia that provides full-text access to articles, research updates and dictionary terms in all areas of science and technology. Also contains biographies, weekly updates on hot topics and discoveries, a student center with resource guides and links to related sites. Updated daily.
- Computers and Applied Sciences Complete: Incorporates Computer Science Index, Computer Source, Information Science and Technology Abstracts, Internet and Personal Computing Abstracts and includes academic journals, professional publications and other reference sources. Subject areas include the many engineering disciplines, computer theory and new technologies.
- Derwent Innovations Index: Available through the ISI Web of Knowledge interface. Merges the Derwent World Patents Index with the Derwent Patents Citation Index. Provides access to more than 14,800,000 patents with links to cited and citing patents, cited articles and full-text patent data sources. Gives users an overview of inventions in three categories: chemical, electrical and electronic and engineering.
- IEEE/IET Electronic Library (IEL): More than three million full text IEEE journals, conferences and standards, IET journals and conferences, VDE conference papers and all IEEE standards except for the drafts. All content back to 1988 with selected content back to 1872.
- Inspec: Provides access to the world's scientific and technical literature in physics, electrical engineering, electronics, communications, control engineering, computers and computing and information technology; also has significant coverage in areas such as materials science, aeronautics, oceanography, nuclear engineering, geophysics, biomedical engineering and biophysics. Searches Physics Abstracts and more.
- Science Online: Science Online from Facts on File (not the journal Science published by AAAS) presents information on a broad range of scientific disciplines through extensive definitions, essays, diagrams, biographies and experiments.
- Textile Technology Complete: Textile Technology Complete is a scholarly and professional database covering scientific and technological aspects of textile production and processing. Containing over 400 periodical titles, it also draws on current technical reports, books and trade literature. Also includes resources about apparel, home furnishings and polymer industries.

Section F. Evaluation

21. Describe the process for monitoring, evaluating and improving the overall effectiveness and quality of the program, and articulate program-level learning outcomes and objectives.

College faculty will assess and evaluate the program following the existing practices. Various metrics such as course grades, major GPA, time to completion and job placement following graduation will be used to assess the program's student learning outcomes listed below. The data on these metrics are summarized in a program assessment report each year and submitted to Kent State's Office of Accreditation, Assessment and Learning.

The program outcomes are as follows:

1. Use the techniques, skills and modern engineering tools necessary for engineering practice.
2. Apply knowledge of mathematics, science and engineering
3. Design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.

Upon matriculation of the program's first cohort, Kent State University will seek accreditation from the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET). Faculty will back their learning outcomes and assessment techniques for the courses in this program based on ABET criteria.

See Appendix B for more information on student learning outcomes in the program.

22. Describe the process for assessing and improving student learning, including student persistence and completion, in the new program.

While the traditional means to assess learning are employed with this program, such as quizzes, exams, papers and problem sets, the nature of this program lends itself to a natural assessment process because about half of the courses have a lecture and a lab component to them. This provides students with the opportunity to learn the material during the lecture and then apply what they have learned during the lab. This format allows students to be exposed to the same material more than once, which not only increases their likelihood of learning it but the resulting lab report or project is a good learning assessment tool.

Labs provide an active way to learn which helps students stay engaged. This along with designing the course material so that students will understand how the material is relevant to them, how it applies to their everyday life and how it improves their chances of getting the job they may someday want, increases persistence.

Another way student learning is assessed is through internships. This program does require that every student participate in an internship. The student is required to journal about their experience weekly and write a paper at the end of the semester. This encourages the student to articulate what they have learned which is a good assessment tool. The employer is also asked to evaluate the student and provide feedback about the student's knowledge and performance. Having a "real-world" experience provides the student with the opportunity to understand why they take the courses that they do, implement what they have learned and determine what they may like to do in the future, which increases persistence.

ADDENDUM to HIGHER LEARNING COMMISSION SUBSTANTIVE CHANGE APPLICATION TO ESTABLISH A NEW UNDERGRADUATE DEGREE PROGRAM

Proposed Major:	Mechanical Engineering Technology
Proposed Degree:	Bachelor of Science
Administrating College:	College of Aerospace and Engineering
Administrating Department:	N/A

Provide the title of the lead administrator for the proposed program and a brief description of the individual's duties and responsibilities.

Kent State's College of Aeronautics and Engineering, functions as one organizational unit with two separate and distinct program areas: aeronautics and engineering. Each program area is led by a program director.

The proposed Mechatronics Engineering Technology degree program will reside in the engineering program area under the leadership of interim director Jackie Ruller, M.S. Position duties include developing the course schedule, managing the day-to-day requests/issues, pursuing partnerships with industry personnel, writing proposals and serving on committees.

Indicate whether any institutions of higher education offer the proposed program within a 30-mile radius of the campus(es) at which the proposed program will be offered. If so, list the institutions that offer the proposed program and provide a rationale for offering an additional program at this campus.

At present, there are two public universities in Northeast Ohio offering an ABET-accredited bachelor's degree in mechanical engineering technology: University of Akron and Youngstown State University.

The program at Kent State has existed for more than 27 years as a concentration (previously names: "manufacturing systems" and "manufacturing engineering technology"). Since 2013, under the name "mechanical engineering technology," the program has seen great advancement in terms of enrollment.

Fall Semester Student Enrollment (15th Day Census)
Mechanical Engineering Technology Concentration

Fall 2013	Fall 2014	Fall 2015	Fall 2016	Fall 2017
10	54	102	120	142

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DESCRIPTION

The Bachelor of Science degree in Mechanical Engineering Technology teaches design, operation, installation, maintenance and analysis of machinery. The program prepares students to become highly technical professional in current and emerging fields using mechanical and computer-aided engineering. Students learn to develop innovative solution to problems encountered in manufacturing.

Fully Offered At:

Kent Campus

ACCREDITATION

Not applicable.

ADMISSION REQUIREMENTS

Standard admission criteria.

PROGRAM LEARNING OUTCOMES

Graduates of this program will be able to:

1. Use the techniques, skill, and modern engineering tools necessary for engineering practice.
2. Apply knowledge of mathematics, science and engineering
3. Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.

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PROGRAM REQUIREMENTS:

Major Requirements (courses count in major GPA)

TECH 13580	Engineering Graphics I	3
TECH 20001	Energy/Power	3
TECH 20002	Materials and Processes	3
TECH 21021	Survey of Electricity and Electronics	4
TECH 23581	Computer-Aided Engineering Graphics	3
TECH 26010	Introduction to Computer Engineering Technology	3
TECH 26200	Programming for Engineers I (NEW)	3
TECH 31000	Cultural Dynamics of Technology (DIVD) (WIC)[1]	3
TECH 33031	Programmable Logic Controllers	3
TECH 33033	Hydraulics/Pneumatics	3
TECH 33111	Strength of Materials	3
TECH 33363	Metallurgy and Materials Science	3
TECH 34002	Advanced Computer-Aided Design II	3
TECH 36200	Programming for Engineers II (NEW)	3
TECH 43080	Industrial and Environmental Safety	3
TECH 43550	Computer-Aided Manufacturing	3
TECH 43580	Computer-Aided Machine Design	3
TECH 43800	Applied Engineering Technology Seminar (ELR)	3
Technical Electives, choose from the following:		12
TECH 31065	Cast Metals	
or TECH 36620	Project Management in Engineering and Technology	
TECH 33040	Motors and Controllers	
TECH 43030	Mechatronics	
TECH 43031	Mechatronics II	
TECH 43096	Individual Investigation in Applied Science and Technology	
TECH 43700	Computer Integrated Manufacturing	
TECH 47200	Systems Engineering	
TECH 47210	Sustainable Energy I	
TECH 47211	Sustainable Energy II	

Additional Requirements (courses do not count in major GPA)

ACCT 23020	Introduction to Financial Accounting	3
CHEM 10050	Fundamentals of Chemistry (KBS)	3
COMM 15000	Introduction to Human Communication (KADL)	3
ECON 22060	Principles of Microeconomics (KSS)	3
ENG 20002	Introduction to Technical Writing	3
MATH 11022	Trigonometry (KMCR)	3
MATH 12002	Analytic Geometry and Calculus I (KMCR)	5
PHY 13001	General College Physics I (KBS)	4
PHY 13002	General College Physics II (KBS)	4
PHY 13021	General College Physics Laboratory I (KBS) (KLAB)	1
PHY 13022	General College Physics Laboratory II (KBS) (KLAB)	1
UC 10097	Destination Kent State First Year Experience	1
Kent Core Composition		6
Kent Core Humanities and Fine Arts (minimum one course from each)		9
Kent Core Social Sciences (must be from two disciplines)		3
General Elective (total credit hours depends on earning 120 credit hours, including 39 upper-division credit hours		1

Minimum Total Credit Hours: 120

1. A minimum C grade must be earned to fulfill the writing-intensive requirement.

GRADUATION REQUIREMENTS:

Minimum Major GPA: 2.25
Minimum Overall GPA: 2.00

CATALOG COPY

ROADMAP

Semester One		
MATH 11022	Trigonometry (KMCR)	3
TECH 13580	Engineering Graphics I	3
TECH 26010	Introduction to Computer Engineering Technology	3
UC 10097	Destination Kent State: First Year Experience	1
Kent Core Requirement		3
Kent Core Requirement		3
	Credit Hours:	**16**
Semester Two		
COMM 15000	Introduction to Human Communication (KADL)	3
MATH 12002	Analytic Geometry and Calculus I (KMCR)	5
PHY 13001	General College Physics I (KBS)	4
PHY 13021	General College Physics Laboratory I (KBS) (KLAB)	1
TECH 23581	Computer-Aided Engineering Graphics	3
	Credit Hours:	**16**
Semester Three		
ECON 22060	Principles of Microeconomics (KSS)	3
PHY 13002	General College Physics II (KBS)	4
PHY 13022	General College Physics Laboratory II (KBS) (KLAB)	1
TECH 20002	Materials and Processes	3
Kent Core Requirement		3
	Credit Hours:	**14**
Semester Four		
ACCT 23020	Introduction to Financial Accounting	3
ENG 20002	Introduction to Technical Writing	3
TECH 21021	Survey of Electricity and Electronics	4
TECH 26200	Programming for Engineers I	3
Kent Core Requirement		3
	Credit Hours:	**16**
Semester Five		
CHEM 10050	Fundamentals of Chemistry (KBS)	3
TECH 20001	Energy/Power	3
TECH 33111	Strength of Materials	3
TECH 33031	Programmable Logic Controllers	3
TECH 36200	Programming for Engineers II	3
	Credit Hours:	**15**
Semester Six		
TECH 31000	Cultural Dynamics of Technology (DIVD) (WIC)	3
TECH 33033	Hydraulics/Pneumatics	3
TECH 33363	Metallurgy and Materials Science	3
TECH 34002	Advanced Computer-Aided Design II	3
Technical Elective		3
	Credit Hours:	**15**
Semester Seven		
TECH 43550	Computer-Aided Manufacturing	3
TECH 43580	Computer-Aided Machine Design	3
Technical Elective		3
Kent Core Requirement		3
Kent Core Requirement		3
	Credit Hours:	**15**
Semester Eight		
TECH 43080	Industrial and Environmental Safety	3
TECH 43800	Applied Engineering Technology Seminar (ELR)	3
Technical Electives		6
General Elective		1
	Credit Hours:	**13**
	Minimum Total Credit Hours:	**120**

Robert G. Sines, Jr.
Interim Dean
College of Aeronautics and Engineering
1400 Lefton Esplanade
Kent, Ohio 44240

Dear Mr. Sines:

AMETEK HKP would like to express its support of Kent State's proposed Mechatronics Engineering, Mechatronics Engineering Technology, Computer Engineering Technology and Mechanical Engineering Technology programs. Over the next 5 years, we will need to hire graduates with experience in CAD, controls expertise, applying and testing stepper and servo motors and controls, and systems design.

It is difficult to find young talent that has theoretical and hands on electro-mechanical expertise. Thus, these programs resulting in graduates with a high level of knowledge as well as graduates with significant experience in the application, design, and use of today's machine control system architectures would give them a significant competitive advantage entering the workforce. All programs would provide graduates that would be a valuable resource of future employees for AMETEK.

In addition to the in-class curriculum, we would be very interested in co-op or internship programs that expose your students to real world projects and opportunities. Again, this type of experience would provide your students with an important advantage when compared to other recent graduates.

Key industries such as consumer goods, life sciences, food and beverage, tire and automotive manufacturing are facing workforce shortages and the engineering and technical skills to design and maintain automated, mechanical and electrical systems is critical to their success.

Regards,

Phil Faluotico

330-357-6252

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Phil Faluotico
Director of Engineering

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www.ametekpmc.com
E-mail: phil.faluotico@ametek.com

PITTMAN Haydon kerk

Robert G. Sines, Jr.
Interim Dean
College of Aeronautics and Engineering
1400 Lefton Esplanade
Kent, Ohio 44240

Dear Mr. Sines:

My name is Kevin Ballard. I am 2010 graduate of your college and now serve as the Production Engineering Manager at Rambus' Lighting Division in Brecksville, OH. At Rambus, I lead a team that is charged with development of new manufacturing processes and technologies that enable our company to produce our industry leading product designs.

I would like to express my support of Kent State's proposed Mechatronics Engineering, Mechatronics Engineering Technology, Computer Engineering Technology and Mechanical Engineering Technology programs. Over the next five years, we will need to hire graduates with experience in articulated robotics, machine vision, machine safety, factory data analytics, and lean manufacturing.

It is difficult to find young talent that has any controls engineering expertise, or an understanding of how manufacturing systems, and the data they generate can be utilized to improve the operation of the business as a whole. It is also difficult to find people of any age that truly understand how the design of the equipment, robotics, and plant floor directly affect performance and uptime of the operation.

In addition to the in-class curriculum, we would be very interested in co-op or internship programs that expose your students to real world projects and opportunities. Again, this type of experience would provide your students with an important advantage when compared to other recent graduates.

With almost all Co-Ops, or traditional Mechanical Engineers that I have worked with thus-far, we have found very little comprehension of the concepts outlined above. The education background I received at Kent State has given me a unique advantage because I was able to build on the concepts from the moment I left school. We feel the lack of talent and knowledge in this field every day, whether it be through our own organization, or our suppliers of production equipment. With that being said, I believe that the prospects will continue to improve, for graduates of your programs.

Sincerely,

Kevin Ballard
Production Engineering Manager
Rambus Lighting Division
6611 W. Snowville Rd.
Brecksville, OH 44319
Kballard@rambus.com

North Central State College

October 18, 2017

Chancellor John Carey
Department of Higher Education
25 South Front Street
Columbus, Ohio 43215

Dear Chancellor Carey:

I am writing this letter on behalf of North Central State College to express support for the engineering programs in the College of Aeronautics and Engineering (CAE) at Kent State University. A goal of ours is to provide our students with different pathways and good opportunities when they leave North Central State College. Consequently, we have been working with staff and faculty at Kent State to create pathways for our students in which they would earn college credit from our institution that may be applied to programs in CAE. In particular, CAE would like to move three of the concentrations (mechatronics engineering technology, computer engineering technology and mechanical engineering technology) under the Bachelor of Science in Applied Engineering program to their own major. As majors, the programs would be more visible and there would be more flexibility in the curriculum. These programs complement our associate level programs and can provide a valuable next step in a student's career pathway.

One of the reasons that the programs in CAE are such a good fit for our programs is their applied nature. I understand that CAE is participating in the NEO RAPIDS 2 proposal in the hope of acquiring a FANUC Integrated Cell. Our students in our engineering tech programs have the opportunity to receive training on FANUC robots. Having the opportunity to work with the FANUC Integration Cell at Kent State is again, the perfect complement to the training they receive with us.

In addition, I understand that CAE would like to offer the more theoretical mechatronics engineering program beginning fall of 2018. This program will offer a higher level of math and theory providing an additional pathway for our students who are progressing along calculus pathways in engineering and may prefer careers with a stronger theoretical focus.

In short, we are impressed with the work being done to move CAE forward and make it a stronger partner with community colleges.

Respectfully,

Greg Timberlake, Psy.D.
Dean of Business, Industry, Technology, &
Workforce Development
North Central State College

2441 Kenwood Circle
Mansfield, OH 44906
419.755.4800
888.755.4899
www.ncstatecollege.edu

KENT STATE UNIVERSITY | TUSCARAWAS

January 5, 2017

To Whom It May Concern:

Mechanical engineering technology is a hands on application of mechanical engineering principals to real world applications. While mechanical engineering technology coursework is less theoretical, and more application based than a pure engineering degree, in Northeast Ohio we see a growing need for such specialists as manufacturing becomes more automated.

Moving the Applied Engineering concentration of Mechanical Engineering Technology to a major in its own right will allow this field of study to change with the growing technology needs of manufacturing in Northeast Ohio without being encumbered to the requirements of the current Applied Engineering Degree. I fully support such a move.

Sincerely,

Paul Dykshoorn
Director, Engineering Technology

cc: Dr. Bradley Bielski, Dean, Tuscarawas Campus