Ohio | Board of Regents
University System of Ohio

John R. Kasich, Governor
John Carey, Chancellor

Request for Approval

Submitted by
Kent State University

Establishment of a Bachelor of Science Degree in Aerospace Engineering

Date to come

KENT STATE UNIVERSITY

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REQUEST

Date of submission: *date to come*

Name of institution: Kent State University

Degree/degree program title: Aerospace Engineering major within Bachelor of Science degree

Primary institutional contact for the request

Name: Therese E. Tillett
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Delivery site(s): Kent Campus

Date that the request was approved by the institution's governing board:
Approved by the Kent State University Faculty Senate on *date to come*, and the Board of Trustees on *date to come*.

Proposed start date: Fall 2015

Date Institution established: 1910

Institution's programs: Degree programs at the associate, bachelor's, master's, post-master's, doctoral levels; undergraduate and graduate certificates (total 325 majors in 44 degrees and 61 certificates as of fall 2014)

Educator Preparation Programs:

Program leads to licensure	No
Program leads to endorsement	No

SECTION 1: INTRODUCTION

1.1 Brief summary of the request

Kent State University proposes to offer an Aerospace Engineering major within the Bachelor of Science degree, to be administered by the university's College of Applied Engineering, Sustainability and Technology on the Kent Campus. In recent years, the college has evolved and grown in its mission to enhance technological literacy, education and training essential to the socio-economic well-being and workforce development of the state of Ohio, in general and Northeast Ohio, in particular.

With 1,179students (fall 2014 15th day enrollment), the College of Applied Engineering, Sustainability and Technology offers baccalaureate programs in aeronautics, technology, applied engineering and construction management; numerous undergraduate minors, including sustainability, aircraft dispatch, aviation weather and unmanned aircraft systems; and the Master of Technology degree. The college recently relocated to a new state-of-the-art academic home on the Kent Campus, encompassing 55,000 square feet.

SECTION 2: ACCREDITATION

2.1 Regional accreditation

Original date of accreditation:	1915
Date of last review:	2007 - 2008
Date of next review:	2014 - 2015

2.2 Results of the last accreditation review

Kent State University's accreditation was reaffirmed by the North Central Association Higher Learning Commission on *January date to come*.

2.3 Notification of appropriate agencies

Provide a statement indicating that the appropriate agencies (e.g., regional accreditors, specialized accreditors, state agencies, etc.) have been notified of the institution's request for authorization of the new program. Provide documentation of the notification as an appendix item.

Notification to the Higher Learning Commission is in Appendix A. Kent State will seek accreditation through ABET (formerly Accreditation Board for Engineering and Technology) and will begin the process after establishment of the program is approved by the Ohio Board of Regents and the Higher Learning Commission.

SECTION 3: LEADERSHIP—INSTITUTION

3.1 Mission statement

The mission of Kent State University is to discover, create, apply and share knowledge, as well as to foster ethical and humanitarian values in the service of Ohio and the global community. As an eight-campus educational system, Kent State offers a broad array of academic programs to engage students in diverse learning environments that educate them to think critically and to expand their intellectual horizons while attaining the knowledge and skills necessary for responsible citizenship and productive careers. (www.kent.edu/president/mission-statement.cfm)

3.2 Organizational structure

The Kent State academic organizational structure and administrative leadership and division organizational structure can be found at www.kent.edu/president/organizational-charts

SECTION 4: ACADEMIC LEADERSHIP—PROGRAM

4.1 Organizational structure

Describe the organizational structure of the proposed program. In your response, indicate the unit that the program will be housed within and how that unit fits within the context of the overall institutional structure. Further, describe the reporting hierarchy of the administration, faculty, and staff for the proposed program.

Kent State's College of Applied Engineering, Sustainability and Technology functions as one organizational unit with three separate and distinct program areas (aeronautics, applied engineering and construction management); each program area is led by either a program director or a coordinator. The proposed Aerospace Engineering degree program will reside in the aeronautics program area under the leadership of the aeronautics senior program director. See Appendix B for an organizational chart of this program area within the college.

Provide the title of the lead administrator for the proposed program and a brief description of the individual's duties and responsibilities. Describe the qualifications of this individual for the oversight of a distance education program. Include this individual's CV/resume as an appendix item.

The lead administrator is Senior Academic Program Director Maureen McFarland. Characteristic duties and responsibilities include, but are not limited to, directing the administrative, instructional, operational and technological aspects of the aeronautics program; establishing and/or revising components of the aeronautics program; managing the aeronautics program budget; advising and counseling students and/or program clients; creating, implementing and overseeing the academic schedule; working with faculty in the assignment of academic load; hiring of part-time faculty; and coordinating marketing activities for assigned program. See Appendix C for Ms. McFarland's curriculum vitae.

Describe any councils, committees or other organizations that support the development and maintenance of the proposed program. In your response, describe the individuals (by position) that comprise these entities, the terms of their appointment, and the frequency of their meetings.

Two committees—the Aeronautics Advisory Committee and the College Industry Advisory Board—have supported the development and maintenance of the proposed aerospace engineering program. Members of both have two-year appointments and hold meetings twice a year.

Aeronautics Advisory Committee

Name	Title/Company
Robert Bianco	Chief Engineer, United Technologies Aerospace Systems
Donald Cassaniti	Special Projects Manager, Cleveland Air Traffic Control Tower/TRACON, FAA
Clark Earick	General Manager and Vice President, Corporate Strategy, Delta Private Jets
Michael Heil	President and Chief Executive Officer, Ohio Aerospace Institute
Linell Homentosky	Airport Planner, AECOM
Mark Zuranski	Chief Pilot, Eaton Corporation
Donata Ziedins	Manager of Human Factors, United Airlines

CAEST Industry Advisory Board

Name	Title/Company
Chris Bauer, Capt	President and Chief Executive Officer, Hughes Aerospace Corp.
Robert Bianco	Chief Engineer, United Technologies Aerospace Systems
David DuBois	Principal, The Social Design Group
Charles Ducey	Executive Vice President (retired), Diebold
Steve Eisenbrown	Rockwell Automation (retired)
David J. Enzerra	President, The Lubrizol Foundation
Aaron Hall	Executive Director, Mechanical Contractors Associate of Akron Inc
Jane Harf	Director, University Clean Energy Alliance of Ohio
Rachel Heidenreich	Vice President, Engineering Services, Rockwell Automation
David Mayewski	Business Development Leader, Rockwell Automation
Dennis McGavis	Director, Global Environment Health and Safety, Goodyear
David E. Nash	Director, Corporate Sustainability Network
Frank Natoli	Executive Vice President and Chief Innovation Officer, Diebold
Anthony Rohloff	Founding Partner, Premier Flight Academy, Ltd
Mark D. Saban	Managing Partner, ALPHA Performance Group, LLC
Fred S. Szabo	Commissioner, Cleveland International Airport
David Woodyard	Manager, Global Sustainability, Goodyear
Sharon Can Zeeland	Vice President, Business Development, Fairmount Minerals

4.2 Program development

Describe how the proposed program aligns with the institution's mission.

This request is part of the Kent State University's vision to become a premier Carnegie Foundation Tier One Research University.

Indicate whether the institution performed a needs assessment/market analysis to determine a need for the program. If so, briefly describe the results of those findings. If completed, submit the full analysis as an appendix item.

Technology trends in aerospace engineering are shifting toward increasing the sustainability, safety and reliability of current airframes while minimizing their environmental impact. The proliferation of unmanned aerial systems (UAS) over the past decade has affected the aerospace industry in a way never before anticipated or imagined. Although government dominance has declined in recent years, the rise of the commercial space and UAS industries is expected to translate to a growth rate of 4,000 new jobs in the U.S. between 2010 and 2020.

The emergence of the UAS industry contributes to the greater demand for aerospace engineers within the state. Ohio recently partnered with Indiana to designate an Unmanned Aerial Systems Test Center near Dayton, with the hopes of becoming one of the FAA's UAS Unmanned Aerial Systems Test Centers. With the requirements to integrate unmanned aerial systems into the National Airspace System as part of the 2012 FAA Reauthorization Act, an aerospace engineering curriculum at Kent State University, combined with its already established and recognized programs in air traffic control and aeronautics systems engineering technology (concentrations within the Aeronautics major), would be poised to play a significant role in these aerospace milestones.

Ohio ranks fourth across the country for the highest employment level of aerospace engineers, and 10th nationwide for the highest concentration of aerospace engineering jobs and location quotients[1].

Ohio Region	Employment	Employment per 1000 jobs	Location quotient[2]	Annual mean wage
Dayton	1,450	3.94	7.31	$105,760
Cleveland, Elyria, Mentor	590	0.58	1.08	$106,000
Cincinnati-Middletown, OH-KY-IN	110	0.110	1.39	$62,000

There are no public universities in Northeast Ohio offering an ABET-accredited aerospace engineering degree program. There are only two publically-assisted, ABET-accredited aerospace engineering programs state-wide, at the University of Cincinnati and Ohio State University[3].

Case Western Reserve University offers an ABET-accredited undergraduate aerospace engineering program; however, the annual tuition to attend Case Western is $42,766[4]. Kent State University's annual tuition of $10,012[5] is much more affordable, thereby making the pursuit of an undergraduate degree in aerospace engineering more accessible to Ohioans in the Northeast region.

The base infrastructure for the proposed Aerospace Engineering major is already in place through the existing aeronautical systems engineering technology concentration in the BS Aeronautics major. The Aerospace Engineering major will use several courses offered in the aeronautics program (such as aircraft design, advanced aerospace propulsion and advanced aerodynamics). Kent State will continue to offer the Aeronautics major–Aeronautical Systems Engineering Technology concentration as the program prepares students for careers in the applied and systems engineering fields. In contrast, the proposed Aerospace Engineering major will provide students with a more theoretical, scientific calculus-based approach to the discipline.

Indicate whether the institution consulted with advisory groups, business and industry, or other experts in the development of the proposed program. If so, briefly describe the involvement of these groups in the development of the program.

The opportunities for collaboration in this technology and manufacturing corridor of the state are significant. The Federal Government maintains a strong aerospace presence in Cleveland with the NASA Glenn Research Center. Numerous large industries such as Parker Aerospace, Timkin, Eaton and Materion are headquartered in Northeast Ohio.

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[1] Aerospace Engineers Occupational Employment and Wages (May 2013), Bureau of Labor Statistics, U.S. Department of Labor. Retrieved from www.bls.gov/oes/current/oes172011.htm.
[2] The location quotient is the ratio of the area concentration of employment to the national average concentration. A location quotient greater than one indicates the occupation has a higher share of employment than average, and a location quotient less than one indicates the occupation is less prevalent in the area than average.
[3] The University of Dayton offers an ABET-accredited mechanical engineering undergraduate major that includes a concentration in aerospace engineering.
[4] Case Western Reserve University, *Tuition and Fees: Fall 2014-Spring 2015*. Retrieved from www.cwru.edu/studentaccounts/tuition-fees/undergraduate-tuition-fees.
[5] Kent State University, *Tuition and Fees (2014-2015)*. Retrieved from www.kent.edu/bursar/tuition-and-fees.

Kent State University already has an established relationship with many of these organizations and secured internships for several of its students. Implementing the aerospace engineering curriculum at Kent State will allow the region to capitalize on and strengthen these existing relationships, enhancing their own ties to the region by developing and mentoring competent engineers, a majority of whom come from Northeast Ohio. Letters of support from these industries for the proposed degree program are in Appendix D.

Indicate whether the proposed program was developed to align with the standards of a specialized or programmatic accreditation agency. If so, indicate whether the institution plans to pursue programmatic/specialized accreditation for the proposed program and provide a timeline for achieving such accreditation. If the program is already accredited, indicate the date that accreditation was achieved and provide information on the next required review.

The aerospace engineering program was developed in alignment and accordance with the standards of ABET. Kent State plans to pursue programmatic accreditation for the aerospace engineering program; as per ABET guidelines, this cannot be done until the first class of aerospace engineering students graduates. An accreditation site visit will be requested for the fall of 2019. If accreditation is granted, the first graduating class (those who graduated in the spring of 2019) will be covered by the accreditation.

4.3 Collaboration with other Ohio institutions

Indicate whether any USO institutions within a 30-mile radius of your institution offer the proposed program. If so, list the institutions that offer the proposed program and provide a rationale for offering an additional program at this site.

At present, there are no OSU institutions in Northeast Ohio offering a bachelor's degree in aerospace engineering. The closest institution to the Kent Campus with an ABET-accredited aerospace engineering program is the private Case Western Reserve University.

Indicate whether the proposed program was developed in collaboration with another institution in Ohio. If so, briefly describe the involvement of each institution in the development of this request and the delivery of the program.

Kent State has reached out to Cleveland State University to discuss collaboration. However, at this time, the proposed program will be delivered entirely by Kent State.

SECTION 5: STUDENT SERVICES

5.1 Admissions policies and procedures

Describe the admissions requirements for the program. In your response, highlight any differences between the admission requirements for the program and for the institution as a whole.

The admission criteria for the Aerospace Engineering major are in line with selective-admission programs at Kent State. Admission requires a minimum 3.000 high school GPA, a minimum ACT 24 composite score (minimum ACT subscores of both 24 in English and math), a minimum SAT 1700 composite score (mathematics, criterial reasoning and writing), and the

capability of being placed directly into MATH 12002 Analytic Geometry and Calculus I (or its equivalent). Students who do not meet these requirements may apply for admission to the aeronautical systems engineering technology concentration within the Aeronautics major and apply for transfer into the Aerospace Engineering major at the conclusion of their freshman year; admissions at that time will require a minimum 3.200 cumulative Kent State GPA and a minimum B grade in MATH 12002 Analytic Geometry and Calculus I and PHY 23101 General University Physics I.

Transfer students who wish to be admitted to the Aerospace Engineering program must have completed a minimum 12 semester hours in college-level coursework with a minimum 3.2 cumulative GPA and have earned a minimum B grade in MATH 12002 Analytic Geometry and Calculus I and PHY 23101 General University Physics I (or their equivalents).

Transfer applicants who have completed less than 12 semester hours of college-level coursework will be evaluated on both collegiate and high school records and must submit a final high school transcript and an ACT or SAT score.

Describe the transfer credit policies for the proposed program, including the use of credit transfer review committees and the maximum number of hours that can be transferred into the program. In your response, specifically address the credit that may be transferred according to the Board of Regents' Transfer Assurance Guide (TAG) and Career Technical Credit Transfer (CT^2) initiatives; and other types of transfer credit awarded toward major program requirements (e.g., AP, life experience, CLEP, portfolio).

Kent State's Transfer Center reviews and applies transfer coursework where appropriate as determined by state policies and faculty review. Kent State's residence policy requires that transfer students complete a minimum 30 semester hours (including 9 semester hours of upper-division coursework in the major) at Kent State to be awarded a Kent State bachelor's degree. Once the Aerospace Engineering major is approved and offered, Kent State will work with the Ohio Board of Trustees to approve coursework for the engineering Transfer Assurance Guide (TAG).

The majority of courses in the Kent Core (general education requirements) are approved as Ohio Transfer Module courses. Credit earned through military service, Advanced Placement (AP), International Baccalaureate (IB), College Level Examination Program (CLEP) and Kent State's Credit-by-Exam is awarded for general education requirements and electives.

5.2 Student administrative services

Indicate whether the student administrative services (e.g., admissions, financial aid, registrar) currently available at the institution are adequate to support the program. If new or expanded services will be needed, describe the need and provide a timeline for acquiring/implementing such services.

The student administrative services currently available at Kent State University are adequate to support the aerospace engineering program; no new services are necessary.

5.3 Student academic services

Indicate whether the student academic services (e.g., career services, counseling, tutoring, ADA) currently available at the institution are adequate to support the program. If new or expanded services will be needed, describe the need and provide a timeline for acquiring/implementing such services.

Student academic services currently available at Kent State University are adequate to support the aerospace engineering program, although there may be some expansion of services needed. For example, as this will be the university's first engineering program, personnel from career services may need to enhance existing procedures to account for the program by creating new career services checklists. This will be done in close coordination and collaboration with the aeronautics program, which has an established working relationship with student academic services.

SECTION 6: CURRICULUM

6.1 Introduction

Provide a brief description of the proposed program as it would appear in the catalog.

The Bachelor of Science in Aerospace Engineering focuses on the application of engineering principles to the design, manufacturing and functionality of aerospace vehicles such as aircraft and spacecraft, to include autonomous and semi-autonomous unmanned aerial systems. Students will gain an in-depth knowledge of aerodynamics, aerospace materials, structures, propulsion, flight mechanics and stability and control while being briefly exposed to orbital mechanics, control, space structures and rocket propulsion.

See Appendix E for the program's entry in the University Catalog.

6.2 Program goals and objectives

Describe the goals and objectives of the proposed program. In your response, indicate how these are operationalized in the curriculum.

The goal of aerospace engineering program objective is to produce engineers who

- possess a deep understanding of the technical fundamentals in aerospace engineering;
- excel in the research, development, innovation and operation of aerospace products and systems; and
- understand the importance of engineering and the responsibility of engineers to society.

Graduates of the BS degree in Aerospace Engineering major will be able to:

1. Apply knowledge of mathematics, science and engineering.
2. Design and conduct experiments, and analyze and interpret data.
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.
4. Function on multidisciplinary teams.
5. Identify, formulate and solve engineering problems.
6. Understand professional and ethical responsibility.
7. Communicate effectively, via both written and verbal means.

8. Understand the impact of engineering solutions in a global, economic, environmental and societal context.
9. Recognize the need for, and able to engage in life-long learning.
10. Be aware of contemporary issues in the aerospace industry.
11. Use the techniques, skills and modern engineering tools necessary for engineering practice.

6.3 Course offerings and descriptions

Course (number/name)	Cr hrs	Major Core	Gen Ed (Kent Core)	Elective	OTM TAG CTAG	New/ Existing Course
MAJOR REQUIREMENTS (67 credits)						
AERN 15300 Intro to Engineering Analysis Using Matlab	3	■				New
AERN 15500 Introduction to Aerospace Engineering	3	■				New
AERN 25200 Statics	2	■				New
AERN 25400 Dynamics	3	■				New
AERN 25500 Aerodynamics for Engineers	3	■				New
AERN 35150 Aircraft Structures	3	■				Existing
AERN 35200 Thermal-Fluid Engineering	3	■				New
AERN 35201 Thermal-Fluid Engineering Laboratory	1	■				New
AERN 35300 Aerospace Vehicle Performance	3	■				New
AERN 35400 System Dynamics and Control	3	■				New
AERN 35500 Signals and Circuits	3	■				New
AERN 35501 Signals and Circuits Laboratory	1	■				New
AERN 35600 High-Speed Aerodynamics	3	■				New
AERN 45121 Advanced Aerospace Propulsion	3	■				Existing
AERN 45291 Aerospace Senior Seminar	1	■				Existing
AERN 45600 Aircraft Stability and Control	3	■				New
AERN 45601 Aircraft Stability and Control Laboratory	1	■				New
AERN 45700 Aircraft Design	4	■				Existing
AERN 45850 Aircraft Design II	3	■				Existing
AERN 45900 Aeroelasticity	3	■				New
AERN Electives	6			■		Existing
TECH 13580 Engineering Graphics I	3	■				Existing
TECH 33111 Strengths of Materials	3	■				Existing
TECH 36620 Project Management in Engineering/Tech	3	■				Existing
KENT CORE (GENERAL EDUCATION) / ADDITIONAL REQUIREMENTS (61 credits)						
CHEM 10050 Fundamentals of Chemistry	3		■		OTM	Existing
ECON 22060 Macroeconomics	3		■		TAG	Existing
MATH 12002 Analytic Geometry and Calculus I	5		■		OTM	Existing
MATH 12003 Analytic Geometry and Calculus II	5		■		TAG	Existing
MATH 21001 Linear Algebra With Applications	3	■			TAG	Existing
MATH 22005 Analytic Geometry and Calculus III	4	■			TAG	Existing
MATH 32044 Intro to Ordinary Differential Equations	3	■			TAG	Existing
MATH 42045 Introduction to Partial Differential Equations	3	■				Existing
PHY 23101 General University Physics I	5		■		TAG	Existing
PHY 23102 General University Physics II	5		■		TAG	Existing
US 10097 Destination Kent State: First Year Experience	1		■			Existing
Kent Core Composition	6		■		OTM	
Kent Core Humanities and Fine Arts	9		■		OTM	Existing
Kent Core Social Sciences	3		■		OTM	Existing
Kent Core Additional	3		■		OTM	Existing

Major Core Course Descriptions (syllabi provided in Appendix F)

AERN 15300 Matlab® for Aerospace Engineers. Introduction to the Matlab® computing language, the industry-standard "first language" for engineers. Algorithm coding and development, debugging, analysis, and interpretation.

AERN 15500 Introduction to Aerospace Engineering. Introduction to the field of aerospace engineering beginning with a historical perspective followed by an introduction to the fundamentals of fluid mechanics, applied aerodynamics, propulsion systems, airplane performance, stability, orbital motion, and launch vehicle performance.

AERN 25200 Statics. Forces and moments; equilibrium in two and three dimensions; multi-force members; equilibrium, centroids and friction.

AERN 24500 Dynamics. Kinematics and kinetics of rigid bodies in planar motion and an introduction to the kinematics and kinetics of rigid bodies in three-dimensional motion.

AERN 25500 Aerodynamics for Engineers. Basic concepts, conservation laws, potential, airfoil and wing analysis. Boundary layers on plates and airfoils. Pressure gradients. Introduction to turbulent and vortex-dominated flows.

AERN 35150 Aircraft Structures. Aircraft structural design investigations dealing with theory and applications in aviation.

AERN 35200 Thermal-Fluid Engineering. First and Second Law of Thermodynamics for closed and open systems. Fundamentals of fluid mechanics. Fundamentals of heat transfer.

AERN 35201 Thermal-Fluid Engineering Laboratory. Laboratory demonstrations and experiments for various heat transfer and fluid dynamics concepts.

AERN 35300 Aerospace Vehicle Performance. Performance analysis of fixed-wing aircraft, rotorcraft, and spacecraft. Equations of motion, evaluation of forces, and performance calculations. Steady and accelerated flight performance.

AERN 35400 System Dynamics and Control. Dynamic modeling and response of systems with mechanical, hydraulic, electrical, and/or thermal elements. Classical methods of feedback control system design and analysis.

AERN 35500 Signals and Circuits. An introduction to electric circuit elements and electronic devices and a study of circuits containing such devices. Both analog and digital systems are considered.

AERN 35501 Signals and Circuits Laboratory. Laboratory demonstrations and experiments for electrical circuits, data acquisition, and signal measurement.

AERN 35600 High-Speed Aerodynamics. Compressibility effects on airfoil and wing aerodynamics; supersonic potential flow; method of characteristics; boundary layer effects on aircraft performance.

AERN 45121 Advanced Aerospace Propulsion. A thorough study of propulsion systems used in the aeronautics industry beginning with an introduction to the reciprocating engine and ending with the study of modern rocketry. Emphasis is given to advanced systems such as gas turbine engines and hypersonic propulsion systems.

AERN 45291 Aerospace Senior Seminar. (Repeatable for credit) Seminar on selected topics relating to problems, issues and conditions of employment within aviation.

AERN 45600 Aircraft Stability and Control. Three-dimensional rigid body dynamics, aircraft equations of motion, principles of static stability and control, dynamic stability of uncontrolled motion, gyroscopic instruments.

AERN 45601 Aircraft Stability and Control Laboratory. Laboratory demonstrations and experiments for various aspects of aircraft stability and control.

AERN 45700 Aircraft Design. Preliminary design of a fixed-wing aircraft for a specific mission: weight estimates; wing planform, airfoil and propulsion; selection airframe configuration and layout design; performance analysis; and overall systems integration.

AERN 45850 Aircraft Design II. Second of a two-course series of aerospace design. Preliminary design or case study of an aerospace vehicle, including but not limited to aircraft, rotorcraft, and spacecraft. Primary focus on sub-system design (i.e., propulsion, structure, controls, etc.), and overall vehicle integration of these subsystems. Cost analysis and safety analysis. Final technical report and/or model prototype.

AERN 45900 Aeroelasticity. Review of beam analysis. Structural dynamics of one-dimensional systems. Analysis of static aeroelastic phenomena, unsteady aerodynamics and flutter. Equations of motion for complete aeroelastic systems; solution techniques.

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

TECH 33111 Strengths of Materials. An analytical study of the relaxation between the external forces applied to elastic materials and the resulting deformations and stresses.

TECH 36620 Project Management in Engineering and Technology. 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.

6.4 Program sequence

The proposed curriculum sequence as indicated by the roadmap can be found in Appendix G.

6.5 Alternative delivery options:

The Aerospace Engineering major will be offered online (fully or hybrid) or using a flexible or accelerated delivery model.

6.6 Off-site program components (please check all that apply):

☒ Co-op/Internship/Externship	☐ Student Teaching	☐ Other
☐ Field Placement	☐ Clinical Practicum	

While a co-op/internship is not a requirement of the aerospace engineering program at this time, in consideration of the university's experiential learning requirement and in support of student career progression and programmatic assessment requirements, the college will seek to formalize as many internship opportunities in aerospace engineering as possible. Kent State University offers a cooperative education program for its undergraduates.

SECTION 7: ASSESSMENT AND EVALUATION

7.1 Program assessment

Describe the policies and procedures in place to assess and evaluate the proposed program. In your response, include the following: name of the unit/position responsible for directing assessment efforts; description of any committees or groups that assist the unit; description of the measurements used; frequency of data collection; frequency of data sharing; and how the results are used to inform the institution and the program.

The senior academic program director of the Aerospace Engineering major will direct assessment efforts. Committees or groups that assist the efforts include the Industry Advisory Board, Aeronautics Advisory Committee, college faculty and staff, current undergraduate and graduate students; alumni and employers.

The aerospace engineering faculty will conduct focus groups, surveys and course data reports at the conclusion of each semester. The course data reports will be completed each semester; the review and revision of programmatic goals and objectives will be completed bi-annually. The data will be shared annually. Results will be used to inform the institution and the program of any required modification and/or changes to the existing program to include academic policies, prerequisites, course sequencing and addition or deletion of any courses.

7.2 Measuring student success

Describe the policies and procedures in place to measure individual student success in the proposed program. In your response, include the following: name of the unit/position responsible for directing these efforts; description of any committees or groups that assist the unit; description of the measurements used; frequency of data collection; frequency of data sharing; how the results are used to inform the student as they progress through the program; and initiatives used to track student success after program completion.

The senior academic program director of the Aerospace Engineering major will direct student success efforts. Committees or groups that assist the efforts include the Industry Advisory Board, Aeronautics Advisory Committee, college faculty and staff, current undergraduate and graduate students; alumni and employers.

The aerospace engineering faculty will conduct focus groups, surveys and course data reports at the conclusion of each semester. In addition, academic reports will be compiled of students' average GPA, course completion rates, etc. The course data reports will be completed and shared each semester.

The college's aeronautics division hosts a student information session at the beginning of each semester; communicates via email announcements, posts updates on the advising announcement board, and solicits faculty announcements in each respective classroom;

Initiatives to track graduates' success include graduate surveys, employer surveys, *Aero Flyer* newsletter (maintaining engagement with alumni).

SECTION 8: FACULTY

8.1 Faculty appointment policies

Describe the faculty designations available (e.g., professor, associate professor, adjunct, instructor, clinical) for the proposed program's faculty. In your response, define/describe the differences between the designations.

Full professor: As with the associate professorship, a faculty member must possess the terminal degree in the discipline before promotion consideration. Exceptions can be made in particular cases, provided that such exceptions can be justified by the candidate's unit and are approved by the college dean (if applicable) and the provost. A faculty member will usually not be considered for advancement to this rank until completion of five years as an associate professor, but in extraordinary cases may be considered after completion of fewer years as an associate professor. A non-tenured faculty member applying for promotion to the rank of full professor must also undergo a successful tenure review.

Associate professor: This is one of the two senior tenure-track ranks in academia; accordingly, a faculty member must possess the terminal degree in the discipline before promotion consideration. Exceptions can be made in particular cases, provided that such exceptions can be justified by the candidate's unit and are approved by the college dean (if applicable) and the provost. A faculty member will usually not be considered for advancement to this rank until completion of four years as an assistant professor, but in extraordinary cases may be considered after completion of fewer years as an assistant professor. A non-tenured faculty member applying for promotion to the rank of associate professor must also undergo a successful tenure review.

Assistant professor: A tenure-track assistant faculty member will not be considered for advancement to this rank until either completion of three years as an instructor and possession of at least the master's degree, or until the academic credentials minimally required for initial appointment at the assistant professor's level are achieved.

Lecturer: This rank is intended for persons initially hired as full-time, non-tenure-track who do not possess the terminal degree in their discipline or a related field, and may not have the credentials to qualify as an associate lecturer or senior lecturer. Full-time, non-tenure-track lecturers are hired by the college dean in consultation with the College Advisory Committee and the associated academic program area coordinator. Full-time, non-tenure-track lecturers may vote and serve on some college committees.

Adjunct: This faculty status is an honorific designation denoting the affiliation with a Kent State University program or department of an individual whose primary employment is from outside the university or the department in which adjunct status is held.

Describe the credentialing requirements for faculty who will be teaching in the program (e.g., degree requirements, special certifications or licenses, experience).

All tenure-track faculty in the aerospace engineering program must have a PhD in aerospace engineering or a related field, or be a doctoral candidate in the same category with the expectation of completion within one year of hiring.

Describe the institution's load/overload policy for faculty teaching in the program.

Workload expectations and specification of workload equivalents of classroom instructional assignments are incorporated in each academic unit's or campus' section of its faculty handbook.

Assignment to instructional overloads for additional compensation is neither a regular expectation nor an obligation of employment of a faculty member. An overload occurs when, and only when, a person exceeds the number of hours which are listed as his/her load in his/her current contract. In instances in which an overload assignment is authorized by the Office of the Dean, the assignment ordinarily may not exceed one additional course for a semester. Exceptions to this rule require prior written authorization from the Office of the Provost upon recommendation from the appropriate dean.

Indicate whether the institution will need to identify additional faculty to begin the proposed program. If additional faculty members are needed, describe the appointment process and provide a timeline for hiring such individuals.

In 2012, Kent State's College of Applied Engineering, Sustainability and Technology conducted a search for two tenure-track faculty members for the proposed aerospace engineering program. One position was filled. It was determined by college leadership that the second position will be filled only if and when the proposal for aerospace engineering is approved. If approved, the position for the second aerospace engineering faculty will immediately be opened, with the expectation that the new faculty member begin in the fall of 2016. If the proposal is not approved, the current aerospace engineering faculty member will continue to teach in the aeronautical systems engineering technology area of concentration within aeronautics.

8.2 Program faculty

Provide the number of existing faculty members available to teach in proposed program.

Full-time: 2 Less than full-time: 1

Provide an estimate of the number of faculty members to be added during the first two years of program operation.

Full-time: 1 Less than full-time: 1

8.3 Expectations for professional development/scholarship

Describe the institution's general expectations for professional development/scholarship activities by the proposed program's faculty. In your response, describe any differences in the expectations for tenure-track vs. non tenure-track faculty and for full-time vs. part-time faculty. Indicate the financial support provided for such activities. Include a faculty handbook outlining the expectations and documenting support as an appendix item.

Expectations for professional development and scholarship activities vary in accordance with the collective bargaining agreements for both the tenured/tenure-track and non-tenured non-tenured track faculty. Funding is available for both.

Additionally, Kent State's Center for Teaching and Learning provides a resource to all university faculty for teaching, learning innovation and educational support. The center's four main areas of service are to:

- Connect, network and support continuity in opportunities for faculty to explore, research and support student learning.
- Serve as a portal of all information and services related to faculty at Kent State University.
- Offer expertise and consultation related to specific areas of scholarship and professional issues.
- Provide peer review and guidance on teaching innovations and improvement.

The faculty handbook for the College of Applied Engineering, Sustainability and Technology is in Appendix H.

8.4 Faculty matrix

Complete a faculty matrix for the proposed program. A faculty member must be identified for each course that is a required component of the curriculum. If a faculty member has not yet been identified for a course, indicate that as an "open position" and describe the necessary qualifications in the matrix.

Faculty listed below will teach the major core requirements. See Appendix I for each faculty member's curriculum vita.

* Number of courses taught by the faculty member each year at all campuses

Name of instructor	Rank or title	Full/ part	Degree, discipline, institution, year	Years teach	Additional expertise	Course faculty will teach	Load *
John C. Duncan	Assistant Professor	FT	PhD, Evaluation and Measurement, Kent State University, 1996	26	Aero engineering experience with Boeing, Lockheed Martin, Northrop	AERN 25200 AERN 25400 AERN 45121 AERN 45700 AERN 35200	5
Michael R. Fisch	Assistant Professor	FT	PhD Applied Physics, Harvard University, 1982	29	director, electron beam technology	TECH 13580 TECH 33111	6
E.C. Ivan	Adjunct	PT	MBA, University of Akron 1975	8		TECH 36620	2
D. Blake Stringer	Assistant Professor	FT	PhD, Mechanical and Aerospace Engineering, University of Virginia, 2008	3	20-year military (12 in academic and research and development)	AERN 15300 AERN 15500 AERN 25500 AERN 35400 AERN 35600 AERN 35201 AERN 45900	6
Charles P. Wentz	Adjunct	PT	MS, Engineering (Aerospace), Catholic University of America, 1972	15	Northrup-Grumman Test Engineer	AERN 45600 AERN 45601	2
Open Position	Assistant Professor	FT	PhD required in a technology-related discipline.	3+	5 years in government and industry	AERN 35150 AERN 35300 AERN 35500 AERN 35501 AERN 45291 AERN 45850	6

SECTION 9: LIBRARY RESOURCES AND INFORMATION LITERACY

9.1 Library resources

Describe the involvement of a professional librarian in the planning for the program (e.g., determining adequacy of current resources, working with faculty to determine the need for additional resources, setting the budget for additional library resources/services needed for the program).

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.

Describe the library resources in place to support the proposed program (e.g., print, digital, collections, consortia, memberships).

Book collections: The existing book collection at the Kent State University Libraries 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 Library allocates an annual budget for Monograph and journal purchases for CAEST. The Science Librarian coordinates requests for these purchases. In addition, for materials not available in our 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 of the Library regularly review interlibrary loan reports from collage to identify new collection needs. The following journal titles currently subscribed to at the library are relevant or related to the proposal:

ACM SIGBED Review
ACM SIGCOMM Computer Communication Review
ACM SIGMOBILE Mobile Computing and Communications Review
ACM Transactions on Design Automation of Electronic Systems (TODAES)
ACM Transactions on Embedded Computing Systems (TECS)
ACM Transactions on Internet Technology (TOIT)
ACM Transactions on Sensor Networks (TOSN)
Advanced Functional Materials
Advanced Materials For Optics and Electronics
AEU - International Journal of Electronics and Communications
Analog Integrated Circuits and Signal Processing
Annals of Telecommunications - Annales Des Télécommunications
Information Fusion
Information Management Report
International Journal of Adaptive Control and Signal Processing
International Journal of Circuit Theory and Applications
International Journal of Communication Systems
International Journal of Electrical Power & Energy Systems
International Journal of Emerging Electric Power Systems
International Journal of Imaging Systems and Technology
International Journal of Infrared and Millimeter Waves
Journal of Electronics (China)
Journal of Electrostatics
Journal of Infrared, Millimeter, and Terahertz Waves
Journal of Materials Science: Materials in Electronics

Applied Signal Processing
Applied Superconductivity
Applied Surface Science
Bell Labs Technical Journal
Bioenergy Research
Biomagnetic Research and Technology
Biomedical Signal Processing and Control
Biometric Technology Today
Campus-Wide Information Systems
Card Technology Today
Circuit World
Circuits, Systems, and Signal Processing
COMPEL : The International Journal for Computation and Mathematics in Electrical and Electronic Engineering
Computational Mechanics
Computer Communications
Computer Networks and ISDN Systems
Computer Networks
Computers & Electrical Engineering
Computing
Convergence
Digital Signal Processing
Displays
Electric Power Systems Research
Electrical Engineering in Japan
Electrical Engineering
Electrical Engineering
Electrical Technology
Electronic News
Electronics and Communications in Japan (parts I, II, III: Communications, Electronics, Fundamental Electronic Science)
Energy Conversion and Management
Engineering Failure Analysis
Engineering With Computers
European Transactions On Electrical Power
Finite Elements in Analysis and Design
Fuel Cells Bulletin
Fuel Cells
International Journal of Micrographics & Optical Technology
International Journal of Microwave and Millimeter-Wave Computer-Aided Engineering
International Journal of Rf and Microwave Computer-Aided Engineering
International Journal of Satellite Communications and Networking
International Journal of Satellite Communications
International Journal of Wireless Information Networks
International Journal On Critical Infrastructure Protection
Internet Research: Electronic Networking Applications and Policy
Journal of Broadcasting & Electronic Media
Journal of Network and Computer Applications
Journal of Network and Systems Management
Journal of Optical and Fiber Communications Reports
Journal of Optical Communications and Networking
Journal of Optical Networking
Journal of Optics B: Quantum and Semiclassical Optics
Journal of Radio Studies
Journal of Russian Laser Research
Journal of Signal Processing Systems
Journal of the European Mathematical Society
JSTOR
The Journal of VLSI Signal Processing
Lab On a Chip
Materials Science and Engineering: B
Materials Science in Semiconductor Processing
Mathematics of Control, Signals, and Systems
Microelectronic Engineering
Microelectronics and Reliability
Microelectronics International
Microelectronics Journal (incorporating Journal of Semicustom Ics)
Microwave and Optical Technology Letters
Multidimensional Systems and Signal Processing
Optical and Quantum Electronics
Optical Fiber Technology
Optical Memory and Neural Networks
Optical Networks Magazine
Optical Switching and Networking
Optics & Laser Technology
Opto-Electronics Review
Optoelectronics, Instrumentation and Data Processing
Philips Journal of Research
Philosophical Transactions: Mathematical, Physical & Engineering Sciences
Physical Communication
Plasmas and Polymers
Progress in Photovoltaics: Research and Applications
Quantum and Semiclassical Optics: Journal of the European Optical Society Part B
Radioelectronics and Communications Systems
Radiophysics and Quantum Electronics
Russian Electrical Engineering
Russian Microelectronics
Semiconductor Science and Technology
Semiconductors
Semiconductors
Sensors and Actuators A: Physical
Sensors and Actuators B: Chemical
Sensors Update
Signal, Image and Video Processing
Signal Processing
Silicon Chemistry
Solar Energy Materials and Solar Cells
Soldering & Surface Mount Technology
Solid-State Electronics

Journal of Communications Technology and Electronics
Journal of Computational Electronics
Journal of Computer-Aided Molecular Design
Journal of Computer-Mediated Communication
Journal of Electroceramics
Journal of Electronic Materials
Journal of Electronic Testing
Superconductor Science and Technology
Superlattices and Microstructures
Surface Engineering and Applied Electrochemistry
Telecommunication Systems
Telecommunications Policy
Telematics and Informatics
Wind Energy

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.
- Wright Brothers Collection: Wright Brothers Collection documents the invention of the airplane, the lives of the Wright Family and the Wrights' flying exhibitions in Europe and the United States. The collection provides thorough coverage of the Wrights' early inventive period documenting their early gliders and flight-testing in both North Carolina and Ohio.

The Kent State University Library will be able to provide strong support for research and teaching needs identified in the proposal.

Describe any additional library resources that will be needed to support the request and provide a timeline for acquiring/implementing such services. Where possible, provide a list of the specific resources that the institution intends to acquire, the collaborative arrangements it intends to pursue, and monetary amounts the institution will dedicate to the library budget to support and maintain the proposed program.

The current resources available aforementioned are more than enough to support the program proposed. However, any new resources identified overtime will be acquired as soon as the need is discovered. The science librarian will coordinate the acquisition of said resources by collaborating with the library collection management team. As previously mentioned, the library allocates, and the science librarian administers, the budget to support the academic needs of the students and faculty of College of Applied Engineering, Sustainability and Technology.

9.2 Information literacy

Describe the institution's intent to incorporate library orientation and/or information literacy into the proposed program. In your response, describe any initiatives (e.g., seminars, workshops, orientations, etc.) that the institution uses or intends to use for faculty and students in the program.

The science librarian will conduct information literacy courses, workshops and seminars in support of college faculty and students. For incoming freshman, there will be a course designed to help students learn to select a topic for research, locate reference materials, scholarly books, scholarly journal articles and scholarly websites relevant to their topic.

Along the way, students become familiar with the Kent State University Libraries and its catalog, online databases and sources of good scholarly information on the web. Students learn to cite sources appropriately in either MLA or APA style. Strong emphasis is given to learning to evaluate information to determine how appropriate it is for research and whether it is credible, scholarly information. Issues of copyright, plagiarism and the impact of the Internet on research is be covered.

In addition the science librarian teaches classes where the content is tailored to subject-specific research, and integrates with the curriculum of the proposed program. The science librarian works with college faculty to tailor a session to the specific needs of their courses. The courses are continually updated in order to stay abreast of current developments in pedagogy and instructional technology.

SECTION 10: BUDGET, RESOURCES, AND FACILITIES

10.1 Resources and facilities

Describe additional resources (e.g., classrooms, laboratories, technology) that will be needed to support the proposed program and provide a timeline for acquiring/implementing such resources.

The following classroom laboratory items will be necessary to support the curriculum:

- engine test bench (delivered January 2015)
- wind tunnel (fall 2016)
- signals and circuits lab and equipment (fall 2017)
- controls lab and equipment (spring 2018)

10.2 Budget/financial planning

Complete the table to describe the financial plan/budget for the first three years of program operation.

Fiscal Impact Statement for New Degree Programs				
	Year 1	**Year 2**	**Year 3**	**Year 4**
I. Projected Enrollment				
Headcount full time (12 credit hours/semester)	25	50	75	100
Headcount part time (6 credit hours/semester)	5	10	15	20
Full-time equivalent (FTE) enrollment	27.5	55	82.5	110
II. Projected Program Income				
Tuition (paid by student or sponsor)	279,048	572,401	878,430	1,202,306
Expected state subsidy	125,958	258,373	396,509	542,701
Externally funded stipends, as applicable				
Other income (described in narrative section below)	1,238	4,788	9,638	10,175
Total Projected Program Income	**406,244**	**835,562**	**1,284,577**	**1,755,182**
III. Program Expenses				
New Personnel				
Instruction (technical, professional and general education)				
Full time:**1**				
Part time: **1**	**126,000**			
Non-instruction (indicate roles in narrative section below)				
Full time: **0**				
Part time: **0**				
New facilities/building/space renovation	n/a	n/a	n/a	n/a
Scholarship/stipend support				
Additional library resources	n/a	n/a	n/a	n/a
Additional technology or equipment needs	25,000	50,000	75,000	100,000
Other expenses (if applicable, describe in narrative section below)				
Total Projected Expense	**?**	**?**	**?**	**?**

Budget Narrative: Projected program income accounts for responsibility-centered management (RCM); included "other income" accounts for moderate special course fees. As supported in Section 9, no additional library resources are required.

APPENDICES

Appendix	Description
A	Accreditation Notification
B	College's Aeronautics Division Organizational Chart
C	Aeronautics Senior Program Director Curriculum Vitae
D	Letters of Support
E	Catalog Copy for Aerospace Engineering Program
F	Major Core Syllabi
G	Aerospace Engineering Semester-by-Semester Roadmap
H	Aerospace Engineering Course Implementation Schedule
I	Faculty Handbook – College of Applied Engineering, Sustainability and Technology
J	Program Faculty Curriculum Vita

Kent State University is committed to continual support of the delivery of the Bachelors of Science degree in Aerospace Engineering. If Kent State decides in the future to close the program, the university will provide the necessary resources and means for matriculated students in the program to complete their degree.

Kent State University verifies that the information in the application is truthful and accurate.

Respectfully,

Todd A. Diacon
Senior Vice President for Academic Affairs and Provost
Kent State University