Aerospace Engineering
Master of Science Degree
Doctor of Philosophy Degree

FULL PROPOSAL

Submitted to: Chancellor's Council on Graduate Studies
Ohio Department of Higher Education

Submit date: *to come*

Submitted by: College of Aeronautics and Engineering
Kent State University

KENT STATE UNIVERSITY

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Basic Characteristics of the Proposed Program

1. Brief description of the disciplinary purpose and significance of the proposed degree.

The core principles of aerospace engineering are fundamental to many technological growth industries in Ohio and nationwide. The nation's ability to continue to create advanced engineering aerospace systems for defense, space exploration and aeronautics will rely on a highly knowledgeable workforce with advanced training and research capability in disciplines like aerospace engineering.

A 2019 PricewaterhouseCoopers report[1] ranks Ohio eighth in the country in aerospace manufacturing attractiveness. Further, Ohio is ranked first in supplying innovative aerospace components and systems to the aerospace industry.

Workforce training at the graduate level is critical to maintain this competitive position within the aerospace industry and support the needs in defense, aerospace and aerospace manufacturing and research. The purpose of the proposed M.S. and Ph.D. degrees in Aerospace Engineering is to provide advanced theoretical training and practical research experience for students in this broad-based, high-demand field of study. These programs build upon the undergraduate engineering degree programs offered by Kent State's College of Aeronautics and Engineering. Faculty in the college have research expertise in spacecraft guidance navigation and controls, vertical lift aircraft, aerospace human factors and autonomous aerospace systems

2. Definition of the focus of the program.

The focus of the proposed M.S. and Ph.D. degrees in Aerospace is to provide an advanced theoretical and/or research-oriented curriculum with significant depth in aerospace-specific disciplines, beyond the general fundamentals of the engineering bachelor's degree.

The degree programs have been developed in accordance with criteria set forth in the accreditation requirements of the Accreditation Board of Engineering and Technology (ABET). The college will seek ABET accreditation of its graduate programs at first availability.

According to ABET criteria, aerospace engineering must prepare graduates in either the areas of aeronautical engineering or astronautical engineering, with coverage of some topics in the area not emphasized. Aeronautical engineering topics include aerodynamics, aerospace materials, structures, propulsion, flight mechanics, stability and control. Astronautical engineering topics include orbital mechanics, space environment, attitude determination, control, telecommunications, space structures and rocket propulsion. In addition to these areas, the integration of these topics through system design and optimization is also relevant.[2]

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[1] PricewaterhouseCoopers (May 2019). Aerospace and defense: 2018 year in review and 2019 forecast. Retrieved from www.pwc.com/us/en/industrial-products/publications/assets/pwc-aerospace-defense-2018-review-2019-forecast.pdf.

[2] ABET (25 June 2019). Criteria for Accrediting Engineering Programs, 2018-2019. Retrieved from www.abet.org/accreditation/accreditation-criteria/criteria-for-accrediting-engineering-programs-2018-2019.

3. **Rationale for the degree name.**

   Both the M.S. and Ph.D. degrees are appropriate for Kent State's proposed program, rather than a professional degree title, since master's degree students have the option to pursue original research through the culminating requirement, either a project or a thesis; while Ph.D. candidates will undertake a research dissertation. The degree programs will complement Kent State's existing Bachelor of Science degree in Aerospace Engineering.

4. **Duration of the program.**

   a. **Total credit hours for completion of the program:**

      The M.S. degree program will be 31 semester credit hours. The Ph.D. degree program will be 60 credit hours for post-master's students and 90 credit hours for post-baccalaureate students.

   b. **Normal or typical length of time for students to complete the program:**

      The expected length of time for full-time students to complete the M.S. degree is two years. The expected length of time to complete the Ph.D. degree is six years for full-time post-baccalaureate students and four years for post-master's students.

5. **Proposed initial date for implementation of the program.**

   The proposed implementation is fall 2020.

6. **Admission requirements and admission timing.**

   Applications to both degrees will be accepted for fall, spring and summer terms. Admission requirements include minimum 3.000 GPA and three letters of recommendation. See Appendix A for full admission requirements in the catalog pages.

7. **Primary target audience for the program.**

   The college seeks to recruit a mix of prospective students typical of any other graduate engineering institution. These include (1) current undergraduate students at Kent State University; (2) students from regional, state and national institutions; (3) engineers in industry or government laboratories seeking an advanced degree; (4) international students; and (5) active-duty military officers receiving an advanced civil schooling assignment.

8. **Special efforts to enroll and retain underrepresented groups.**

   a. **Plan to ensure recruitment, retention and graduation of groups underrepresented within the discipline.**

      The College of Aeronautics and Engineering is committed to a robust recruitment and retention plan for traditionally underrepresented student populations. The responsibility to support these efforts is assigned to the college's graduate coordinator, marketing director and assistant dean for external affairs (a new position). In addition, the college relies upon existing affiliations with current undergraduate student groups, including Women in Aviation International, National Gay Pilots Association and Organization of Black Aerospace Professionals.

As student enrollment in the college's engineering programs increases, the college anticipates establishing student chapters of the Society of Hispanic Professional Engineers and the National Society of Black Engineers.

b. Provide as background a general assessment of the following: (1) institution and departmental profiles of total enrollment and graduate student enrollment of under-represented groups within the discipline; and (2) comparison with nationally reported values from National Center for Educational Statistics, Council of Graduate Schools or other authoritative sources. Supply data by demographic group where available.

The tables below provide data on underrepresented minority (URM) students.

Table 1: All students in the College of Aeronautics and Engineering.

	Fall Semester				
	2014	**2015**	**2016**	**2017**	**2018**
Native American/Alaskan	1	0	1	2	1
Black/African American	54	52	50	56	51
Hispanic	26	25	25	32	36
Multi-Racial	15	22	20	24	24
Women	130	117	144	122	111
Total College Enrollment	1,042	1,076	1,176	968	873
URM Total (excluding women)	**96**	**99**	**96**	**114**	**112**
URM Percentage	10%	10%	9%	13%	15%
URM Total (including women)	**226**	**216**	**240**	**236**	**223**
URM Percentage	22%	20%	20%	24%	26%

Table 2: Graduate students in the College of Aeronautics and Engineering.

	Fall Semester				
	2014	**2015**	**2016**	**2017**	**2018**
Native American/Alaskan	0	0	0	0	0
Black/African American	3	2	1	0	0
Hispanic	3	1	0	2	2
Multi-Racial	0	0	0	0	0
Women	20	21	42	30	8
Total Graduate Enrollment	62	68	178	108	48
URM Total (excluding women)	**6**	**3**	**1**	**2**	**2**
URM Percentage	10%	4%	0%	2%	4%
URM Total (including women)	**26**	**24**	**43**	**32**	**10**
URM Percentage	42%	35%	24%	30%	21%

Table 3 provides a comparison of the college with national statistics reported by the National Science Foundation.[3] These statistics may indicate that the College of Aeronautics and Engineering lags behind the national averages in many respects.

[3] National Center for Science and Engineering Statistics (8 March 2019). Women, minorities, and persons with disabilities in science and engineering. National Science Foundation. Retrieved from https://ncses.nsf.gov/pubs/nsf19304.

However, Kent State's college is not a conventional engineering college. It contains engineering, engineering technology and aeronautical sciences, all within the same unit. The national data in table 3 reports 2016 enrollment data for the aerospace engineering discipline only, while the college reports the average data from years 2014-2018 as presented in tables 1 and 2.

Table 3: College comparison with national data.

	Total Enrollment			Graduate Enrollment		
	College	National	Difference	College	National	Difference
Native American/Alaskan	0%	0%	0	0%	0%	0
Black/African American	5%	5%	0	1%	2%	(-1%)
Hispanic	3%	13%	(-10%)	2%	6%	(-4%)
Multi-Racial	2%	3%	(-1%)	0%	1%	(-1%)
Women	12%	21%	(-9%)	26%	15%	(+11%)
URM Total	**22%**	**43%**	**(-21%)**	**29%**	**23%**	**(+6%)**

Not included is data relating to veterans, people with disabilities or members of the LGBTQ+ communities. Nevertheless, it is clear from the data that the college must continue to focus on diversity and inclusion.

Institutional Planning for Program Change

1. What are the physical facilities, equipment and staff needed to support the program?

Current facilities, equipment and staff are in place for the existing bachelor's degree in aerospace engineering and will be sufficient for implementation of the proposed master's and doctoral degrees.

In 2015, the college moved into a new 55,000-square-foot, building on the Kent Campus and has more than doubled the number of lab spaces since then. The College of Aeronautics and Engineering is the primary operator at the Kent State University airport at which construction recently finished on a $7 million, on-site academic center funded in part by Federal Express. The new airport facility includes classrooms, flight debriefing rooms, four new flight simulators and a faculty research laboratory. The college already has a planned expansion to increase its capabilities, which is one of the university's top-five infrastructure priorities.

2. What is the evidence that a market for the new program exists?

a. How has estimated program demand been factored into realistic enrollment projections?

Projected enrollment in the M.S. and Ph.D. degree programs is conservative, assuming an initial enrollment of seven students, total, in the first year of implementation, growing to 30 total students in the fourth year. Growth in the first three years is limited by establishment, development, and expansion of new and existing research facilities as recently hired tenure-track faculty determine their research agendas.

b. How has this evidence been used in planning and budgeting processes to develop a quality program that can be sustained?

The new programs will have a substantial impact on the net income of the College of Aeronautics and Engineering through (1) the generation of research dollars to support equipment and graduate research assistants, and (2) the generation of tuition to support master's degree students pursuing the non-thesis degree. See the Appendix B for the fiscal impact statement.

c. Provide evidence of need for the new degree program, including the opportunities for employment of graduates. Examples of potential metrics of program need include: (1) Student interest and demand: potential enrollment; ability to sustain the critical mass of students; (2) institutional need: plan for overall development of graduate programs at the university; and (3) societal demand: intellectual development; advancement of the discipline; employment opportunities to meet regional, national needs and/or international needs.

Under the guidance of Dean Christina Bloebaum—who held an endowed professorship of aerospace engineering at Iowa State University and previously directed engineering and systems design programs for the National Science Foundation before joining Kent State in 2018—the College of Aeronautics and Engineering is expanding its research endeavors and prioritizing fundraising to expand the college's faculty, facilities and programming.

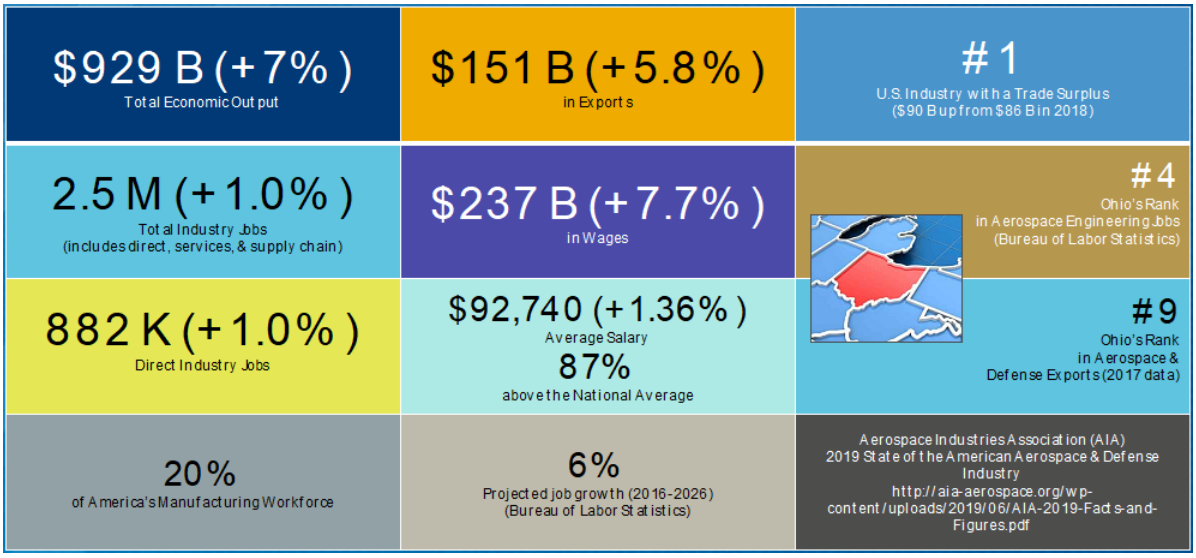
Kent State University's College of Aeronautics and Engineering offers bachelor's and master's degrees within three areas of study: aeronautics, engineering and engineering technology. The college's programs are accredited by the Aviation Accreditation Board International, the Accreditation Board for Engineering and Technology and the Association of Technology, Management and Applied Engineering. Enrollment in the college is approximately 1,000 students.

In the past three years, the college has established seven new bachelor's and master's degrees in engineering and engineering technology, including a B.S. degree in Aerospace Engineering in 2016 and an M.S. degree in Aviation and Logistics Management in 2019. In fall 2019, 63 students were enrolled in the B.S. degree in Aerospace Engineering.

The aerospace and defense industry is a significant force in the American economy. For 2018, the Aerospace Industries Association reported that the industry—which consists of establishments that manufacture, supply and service civil and military aircraft, rotorcraft, space systems, military vehicles and land systems, naval ships, missiles and weapons—contributed more than $374 billion to the U.S. gross domestic product, accounted for nine percent of total U.S. export, was responsible for more than 2.5 million jobs (20 percent of U.S. manufacturing jobs are in the aerospace and defense industry) and paid nearly $237 billion in wages and benefits.[4]

[4] Aerospace Industries Association (June 2019). 2019 state of the American aerospace and defense industry. Retrieved from http://aia-aerospace.org/wp-content/uploads/2019/06/AIA-2019-Facts-and-Figures.pdf.

Figure 1: 2018 aerospace and defense industry statistics from the Aerospace Industries Association. *The number in parentheses illustrate the percentage increase over the previous year's statistics.*



The college has received support for this program from industries such as Lockheed Martin Corporation and Meggit Aircraft Braking Systems, see Appendix C for support letters.

The Industry Advisory Board of the College of Aeronautics and Engineering has endorsed the proposed degree program. Members of the Board are listed in table 4.

Table 4. College of Aeronautics and Engineering Industry Advisory Board

Name	Employer
Chris Baur, President and CEO	Hughes Aerospace Corporation
Robert Bianco, Manager of Materials R&D	UTC Aerospace Systems
Mark Cironi, President and CEO	Green Energy Technologies
Christine Dodd, Director of Public Affairs	IceMiller LLP
David DuBois, Principal	The Social Design Group
Rachel Heidenreich, VP of Quality and Continuous Improvement	Rockwell Automation
David Mayewski, Regional Industry Manager	Rockwell Automation
Frank Natoli, Executive VP and Chief Innovation Officer	Diebold
Roger Quinn, Director of Training	UPS Airlines
Anthony Rohloff, Captain	Delta Airlines
Daniel Sarachene, Colonel	Air Force Reserves
Robert Shaw, Director of Technology and Commercialization Office (Retired)	NASA Glenn Research Center
Sharon Van Zeeland, Director of Corporate Development Operations	Rockwell Automation

Statewide Alternatives

1. What programs are available at other institutions, and how do they differ from the program being proposed?

Three universities in Ohio offer similar programs at the graduate level:

University	Graduate Degree Program
Case Western Reserve University	M.S., Ph.D., Aerospace Engineering
Ohio State University	M.S., Ph.D., Aeronautical and Astronautical Engineering
University of Cincinnati	M.Eng., M.S., Aerospace Engineering Ph.D., Aerospace Engineering and Engineering Mechanics

If approved, Kent State's program will be the only aerospace engineering graduate program offered by a public university in the northern third or eastern third of Ohio.

2. Explain the appropriateness of the specific locale for the program.

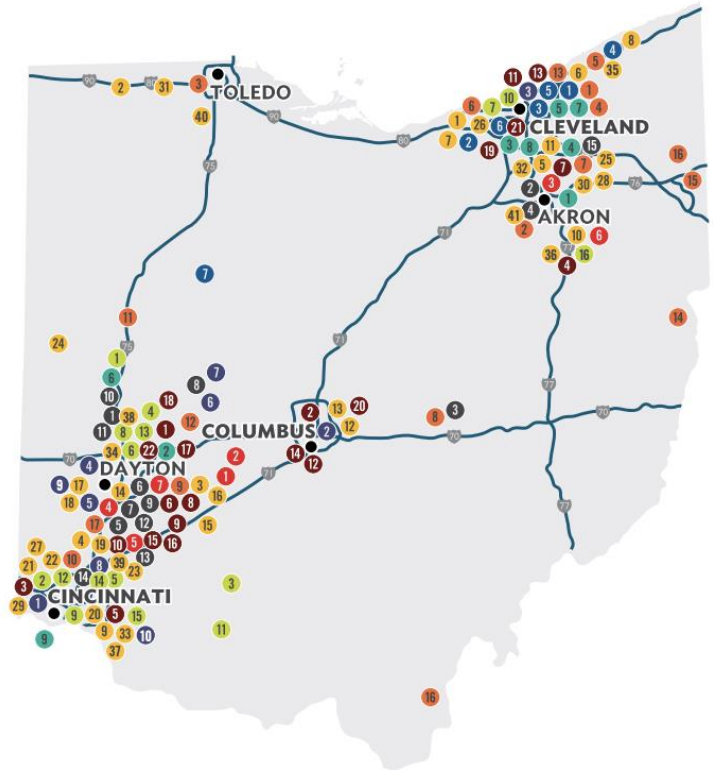
Aviation education at Kent State traces its lineage to the manual training programs in the earliest days of the university, graduating many licensed pilots during World War II and, soon after, establishing degree programs in aeronautics and aerospace technology. The university operates its own airport with a fleet of 33 aircraft.

Kent State's Kent Campus is an appropriate locale for the proposed program due to its proximity to the NASA Glenn Research Center and Ohio Aerospace Institute, both located in Cleveland. As figure 2 on the next page illustrates, the Cleveland-Akron Greater Metropolitan Area is the second largest concentration of aerospace markets and industry, second only to the Cincinnati-Dayton Greater Metropolitan Area. Each dot in the figure represents a company or firm that supports the aerospace industry. The colors represent the type of industry (e.g., propulsion, braking, materials, sensors, unmanned aircraft).

No other region of Ohio, not even Columbus, contains such a density of aerospace industry as these two areas.[5]

[5] JobsOhio (2019). Ohio's aerospace and aviation industry map. Retrieved from www.jobsohio.com/industries/aerospace-aviation.

Figure 2: Ohio's aerospace markets and supply chain.



3. **Are there opportunities for inter-institutional collaboration to offer the program?**

   The College of Aeronautics and Engineering has begun collaborating with other institutions on varying initiatives, whether they be industry, nonprofit, academia or governmental research. Several of the college's faculty members have collaborated with either the NASA Glenn Research Center or the Army Research Laboratory. The college has begun a partnership with the Ohio Aerospace Institute to promote the aerospace industry in Northeast Ohio. Several college researchers have partnered with Case Western Reserve University, Cleveland State University, Ohio State University and Youngstown State University for collaborative research, securing grant funding through the Ohio Federal Research Network totaling $3.7 million.

Growth of the Program

1. **What future growth do you anticipate over several years?**

   The college anticipates program growth occurring together with research funding growth from the college's research-active faculty. As the program receives more exposure, the college expects that non-thesis students in the M.S. degree will be the growth market.

2. **How do you plan to manage this growth?**

   In the past year, the College of Aeronautics and Engineering has added five new tenure-track, research-active faculty. They have provided the college with the capacity for growing research, student enrollment and specific course offerings for the M.S. and Ph.D. degrees.

In 2015, the College of Aeronautics and Engineering moved into a new, 55,000-square-foot building on the Kent Campus and has more than doubled the number of lab spaces since then. In addition, there is a planned wing annex to add an additional 17,000 square feet of faculty, classroom and research space in the building. The university is in the process of fundraising with a projected groundbreaking in 2020. With the addition of this space, the college will have the resources to support the proposed degree program and other programming initiatives.

The college is also the primary operator at the Kent State University airport at which construction recently finished on a $7 million, on-site academic center funded in part by Federal Express. The new airport facility includes classrooms, flight debriefing rooms, four new flight simulators and a faculty research laboratory.

3. When do you expect the program to be self-sufficient?

The program is expected to be self-sufficient in two years with tuition income from M.S. students and grants as a thrust from the college in applying for more research funding. See Appendix B for the program's fiscal impact statement.

Curriculum and Instructional Design

1. Description of the proposed curriculum, including any concentrations, cognates or specializations within the major

The proposed M.S. degree in Aerospace Engineering is 31 credit hours, comprising the following components listed in table 5. See table 6 for the full curriculum.

Table 5: Components of the M.S. degree.

	Credit Hours
Seminar requirement	1
Mathematics requirement	3
Engineering-focus electives	9
Engineering electives	9
Research requirement	3
Thesis or non-thesis option	6
	31

Table 6: Curriculum for the proposed M.S. degree in Aerospace Engineering.

Seminar Requirement (1 credit hour)	
AERN 61091	Aerospace Seminar
Mathematics Requirement (3 credit hours)	
Students select from the following:	
MATH 50015	Applied Statistics
MATH 52011	Mathematical Optimization
MATH 52031	Mathematical Models and Dynamical Systems
MATH 52045	Partial Differential Equations
MATH 52201	Numerical Computing I
MATH 52202	Numerical Computing II

Engineering-Focus Electives (9 credit hours)

Students select one course from three focus areas:

Astronautics

ENGR 58001 Orbital Mechanics NEW
ENGR 58002 Spacecraft Attitude Dynamics, Determination and Control NEW
ENGR 58004 Optimal Control Theory NEW

Dynamics and Control

ENGR 58005 Linear System Analysis and Control NEW
ENGR 58006 Nonlinear Systems and Control NEW
ENGR 58007 Digital Control Systems NEW
ENGR 58200 Autonomous Unmanned Aerial Systems NEW

Structure and Materials

AERN 55901 Finite Element Method and Applications NEW
ENGR 52111 Strength of Materials for Engineers NEW
ENGR 52363 Materials Selection in Design and Applications NEW

Systems and Design

AERN 55700 Aircraft Design
AERN 65270 Human Factors in Systems Design
ENGR 58003 Spacecraft Design NEW
ENGR 58100 Intelligent Sensing and Planning of Unmanned Aerial Systems NEW

Additional courses as approved by advisor

Engineering Electives (9 credit hours)

Students select from the following:

AERN 55700 Aircraft Design
AERN 55901 Finite Element Method and Applications NEW
AERN 65250 Applied Human Factors Engineering
AERN 65270 Human Factors in Systems Design
AERN 65280 Human Information Processing
ENGR 52111 Strength of Materials for Engineers NEW
ENGR 52363 Materials Selection in Design and Applications NEW
ENGR 58001 Orbital Mechanics NEW
ENGR 58002 Spacecraft Attitude Dynamics NEW
ENGR 58003 Spacecraft Design NEW
ENGR 58004 Optimal Control Theory NEW
ENGR 58005 Linear System Analysis and Control NEW
ENGR 58006 Nonlinear Systems and Control NEW
ENGR 58007 Digital Control Systems NEW
ENGR 58100 Intelligent Sensing and Planning of Unmanned Aerial Systems NEW
ENGR 58200 Autonomous Unmanned Aerial Systems NEW
TECH 57200 Systems Engineering

Additional courses as approved by advisor

Research Requirement (3 credit hours)

ENGR 65098 Research NEW

Thesis or Non-Thesis Option (6 credit hours)

Thesis Option

ENGR 65199 Thesis I NEW

Non-Thesis Option

Courses from Major Electives

Minimum Total Credit Hours: 31

The proposed Ph.D. degree in Aerospace Engineering is 60-90 credit hours, comprising the following components listed in table 7. See table 8 for the full curriculum.

Table 7: Components of the Ph.D. degree.

Post-Baccalaureate Track	Credit Hours
Seminars	3
Engineering-focus electives	18
Program electives	30
Research requirement	9
Dissertation	30
	90

Post-Master's Track	Credit Hours
Seminars	3
Engineering-focus electives	18
Research requirement	9
Dissertation	30
	60

The dissertation for the Ph.D. degree is specialized research, leading to a definitive contribution to the candidate's research focus-area. This contribution should be of sufficient importance to warrant publication in a recognized journal. The candidate must successfully propose and defend their research dissertation in a public setting.

Table 8: Curriculum for the proposed Ph.D. degree in Aerospace Engineering

Seminar Requirement (3 credit hours)	
ENGR 81091	Aerospace Seminar (taken three times)
Engineering-Focus Electives (18 credit hours)	
Astronautics	
ENGR 78001	Orbital Mechanics NEW
ENGR 78002	Spacecraft Attitude Dynamics, Determination and Control NEW
ENGR 78004	Optimal Control Theory NEW
Dynamics and Control	
ENGR 78005	Linear System Analysis and Control NEW
ENGR 78006	Nonlinear Systems and Control NEW
ENGR 78007	Digital Control Systems NEW
ENGR 78200	Autonomous Unmanned Aerial Systems NEW
Structure and Materials	
AERN 75901	Finite Element Method and Applications NEW
ENGR 72111	Strength of Materials for Engineering NEW
ENGR 72363	Materials Selection in Design and Applications NEW
Systems and Design	
ENGR 78003	Spacecraft Design NEW
ENGR 78100	Intelligent Sensing and Planning of Unmanned Aerial Systems NEW
Additional courses as approved by advisor	
Program Electives (0-30 credit hours) *	
Advisor-approved courses in or outside College of Aeronautics and Engineering	
Research Requirement (9 credit hours)	
ENGR 85098	Research NEW
Dissertation (30 credit hours)	
ENGR 85199	Dissertation I NEW
Minimum Total Credit Hours for Post-Baccalaureate Students: 90	
Minimum Total Credit Hours for Post-Master's Students: 60	

* Post-baccalaureate students may apply toward the 30 credit hours, a maximum 15 credit hours of coursework outside the College of Aeronautics and Engineering and 9 credit hours of research (maximum 18 credit hours total of research toward the degree).

Catalog pages are in Appendix A. Course descriptions are in Appendix D.

Institutional Staffing, Faculty and Student Support

1. **How many and what types of faculty (full and part time) will be employed in the program? Describe how number and type of faculty is sufficient to support the program (especially if the program contains a research or heavily mentored activity).**

Over the past six years, the College of Aeronautics and Engineering has increased its engineering capabilities by increasing the number of faculty with engineering or closely-related backgrounds—from three full-time faculty members in 2013 to 14 full-time faculty members in 2019. Faculty for the proposed M.S. and Ph.D. degrees in Aerospace Engineering are listed below. Faculty CV are in Appendix E. See updated chart at end of document

Faculty Member	Terminal Degree	Courses Taught and/or Proposed
Ali Abdul-Aziz Associate Professor *Tenured*	Ph.D., Cleveland State University, 1985	AERN 55901/75901 Finite Element Method and Applications
Michael Fisch Associate Professor *Tenured*	Ph.D., Harvard University, 1982	ENGR 52111/72111 Materials Selection in Design and Applications ENGR 52363/72363 Strength of Materials for Engineering
Rui Liu Assistant Professor *Tenure Track*	Ph.D., Colorado School of Mines, 2018	ENGR 58100/78100 Intelligent Sensing and Planning of Unmanned Aerial Systems ENGR 58200/78200 Autonomous Unmanned Aerial Systems
Ye Lu Assistant Professor *Tenure Track*	Ph.D., Purdue University, 2019	ENGR 58001/78001 Orbital Mechanics ENGR 58002/78002 Spacecraft Attitude Dynamics, Determination and Control ENGR 58003/78003 Spacecraft Design
Hossein Mirinejad Assistant Professor *Tenure Track*	Ph.D., University of Louisville, 2016	ENGR 58006/78006 Nonlinear Systems and Control ENGR 58007/78007 Digital Control Systems ENGR 58004/78004 Optimal Control Theory
Maureen McFarland Associate Dean and Assistant Professor *Non-Tenure Track (PT)*	Ph.D., Kent State University, 2017	AERN 61091 Aerospace Seminar ENGR 81091 Aerospace Seminar TECH 57200 Systems Engineering
Chang-Geun Oh Assistant Professor *Tenure Track*	Ph.D., Wright State University, 2015	AERN 65250 Applied Human Factors Engineering AERN 65280 Human Information Processing AERN 65270 Human Factors in Systems Design
Tao Shen Assistant Professor *Tenure Track*	Ph.D., University of Nebraska-Lincoln, 2016	ENGR 58005/78005 Linear System Analysis and Control
David (Blake) Stringer Associate Professor *Tenured*	Ph.D., University of Virginia, 2008	AERN 55700 Aircraft Design

2. **How many, if any, new faculty will be hired for the program?**

   The college has planned for one search for a tenure-track engineering faculty member for academic year 2020.

3. **What are the administrative arrangements for the proposed program, including oversight at the program, department/school and college level?**

   The proposed degree programs will be administered at the college level, similar to other programs in the College of Aeronautics and Engineering. The dean, associate dean for research and graduate coordinator will oversee the program. A dedicated administrative assistant is available to support graduate programs in the college.

4. **Where will any needed financial support and staffing come from?**

   The college has reserve funds to provide financial support. Staffing is already in place for current graduate programs.

Appendix A: Catalog Pages

Aerospace Engineering – M.S.

College of Aeronautics and Engineering
Aeronautics and Technology Building
Kent Campus
330-672-2892
cae@kent.edu
www.kent.edu/cae

Description

The Master of Science degree in Aerospace Engineering provides an advanced theoretical and/or research-oriented curriculum with significant depth in aerospace-specific disciplines, beyond the general fundamentals of the engineering bachelor's degree.

FULLY OFFERED AT:

- Kent Campus

Admission Requirements

- Bachelor's degree in aerospace engineering or a closely related area from an accredited college or university, for unconditional admissions.
- Minimum 3.000 undergraduate GPA (on a 4.000 point scale) for unconditional admissions.
- Official transcript(s)
- Three letters of recommendation
- English language proficiency - all international students must provide proof of English language proficiency (unless they meet specific exceptions) by earning one of the following:
    - Minimum 550 TOEFL PBT score (paper-based version)
    - Minimum 79 TOEFL IBT score (internet-based version)
    - Minimum 77 MELAB score
    - Minimum 6.5 IELTS score
    - Minimum 58 PTE score

For more information about graduate admissions, please visit the Graduate Studies website. For more information on international admission, visit the Office of Global Education website.

Program Learning Outcomes

Graduates of this program will be able to:

- Conduct literature searches, comprehend advanced research materials and uncover connections between related work
- Perform research, discovery and integration by applying advanced knowledge of aerospace engineering
- Communicate problems and solutions in aerospace engineering clearly, both verbally and in writing

Program Requirements

Major Requirements		
AERN 61091	Aerospace Seminar	1
ENGR 65098	Research NEW	3
Mathematics Elective, choose from the following:		3
MATH 50015	Applied Statistics	
MATH 52011	Mathematical Optimization	
MATH 52031	Mathematical Models and Dynamical Systems	
MATH 52045	Partial Differential Equations	
MATH 52201	Numerical Computing I	
MATH 52202	Numerical Computing II	
Engineering-Focus Electives, choose one course from three focus areas:		9
Astronautics		
ENGR 58001	Orbital Mechanics NEW	
ENGR 58002	Spacecraft Attitude Dynamics, Determination and Control NEW	
ENGR 58004	Optimal Control Theory NEW	
Dynamics and Control		
ENGR 58005	Linear System Analysis and Control NEW	
ENGR 58006	Nonlinear Systems and Control NEW	
ENGR 58007	Digital Control Systems NEW	
ENGR 58200	Autonomous Unmanned Aerial Systems NEW	
Structure and Materials		
AERN 55901	Finite Element Method and Applications NEW	
ENGR 52111	Strength of Materials for Engineers NEW	
ENGR 52363	Materials Selection in Design and Applications NEW	
Systems and Design		
AERN 55700	Aircraft Design	
AERN 65270	Human Factors in Systems Design	
ENGR 58003	Spacecraft Design NEW	
ENGR 58100	Intelligent Sensing and Planning of Unmanned Aerial Systems NEW	
Additional courses as approved by advisor		
Engineering Electives, choose from the following:		9
AERN 55700	Aircraft Design	
AERN 55901	Finite Element Method and Applications NEW	
AERN 65250	Applied Human Factors Engineering	
AERN 65270	Human Factors in Systems Design	
AERN 65280	Human Information Processing	
ENGR 52111	Strength of Materials for Engineers NEW	
ENGR 52363	Materials Selection in Design and Applications NEW	
ENGR 58001	Orbital Mechanics NEW	
ENGR 58002	Spacecraft Attitude Dynamics NEW	
ENGR 58003	Spacecraft Design NEW	
ENGR 58004	Optimal Control Theory NEW	
ENGR 58005	Linear System Analysis and Control NEW	
ENGR 58006	Nonlinear Systems and Control NEW	
ENGR 58007	Digital Control Systems NEW	
ENGR 58100	Intelligent Sensing and Planning of Unmanned Aerial Systems NEW	
ENGR 58200	Autonomous Unmanned Aerial Systems NEW	
TECH 57200	Systems Engineering	
Additional courses as approved by advisor		
Thesis or Non-Thesis Option, choose from the following:		6
Thesis Option		
ENGR 65199	Thesis I NEW	
Non-Thesis Option		
Courses from Major Electives		
Minimum Total Credit Hours:		**31**

Aerospace Engineering – Ph.D.

College of Aeronautics and Engineering
Aeronautics and Technology Building
Kent Campus
330-672-2892
cae@kent.edu
www.kent.edu/cae

Description

The Ph.D. degree in Aerospace Engineering provides an advanced theoretical and/or research-oriented curriculum with significant depth in aerospace-specific disciplines, beyond the general fundamentals of the engineering bachelor's degree.

FULLY OFFERED AT:

- Kent Campus

Admission Requirements

- Bachelor's degree in aerospace engineering or a closely related area from an accredited college or university, for unconditional admissions.
- Minimum 3.000 undergraduate GPA (on a 4.000 point scale) for unconditional admissions.
- Official transcript(s)
- Three letters of recommendation
- English language proficiency - all international students must provide proof of English language proficiency (unless they meet specific exceptions) by earning one of the following:
    - Minimum 550 TOEFL PBT score (paper-based version)
    - Minimum 79 TOEFL IBT score (internet-based version)
    - Minimum 77 MELAB score
    - Minimum 6.5 IELTS score
    - Minimum 58 PTE score

For more information about graduate admissions, please visit the Graduate Studies website. For more information on international admission, visit the Office of Global Education website.

Program Learning Outcomes

Graduates of this program will be able to:

- Conduct literature searches, comprehend advanced research materials and uncover connections between related work
- Perform research, discovery and integration by applying advanced knowledge of aerospace engineering
- Communicate clearly problems and solutions in aerospace engineering, both verbally and in writing

Program Requirements

Major Requirements		
ENGR 81091	Aerospace Seminar (taken three times)	3
ENGR 85098	Research NEW	3
ENGR 85199	Dissertation I[1] NEW	30
Advisor-approved courses in or outside College of Aeronautics and Engineering[2]		0-30
Engineering-Focus Electives, choose from the following:		18
Astronautics		
ENGR 78001	Orbital Mechanics NEW	
ENGR 78002	Spacecraft Attitude Dynamics, Determination and Control NEW	
ENGR 78004	Optimal Control Theory NEW	
Dynamics and Control		
ENGR 78005	Linear System Analysis and Control NEW	
ENGR 78006	Nonlinear Systems and Control NEW	
ENGR 78007	Digital Control Systems NEW	
ENGR 78200	Autonomous Unmanned Aerial Systems NEW	
Structure and Materials		
AERN 75901	Finite Element Method and Applications NEW	
ENGR 72111	Strength of Materials for Engineering NEW	
ENGR 72363	Materials Selection in Design and Applications NEW	
Systems and Design		
ENGR 78003	Spacecraft Design NEW	
ENGR 78100	Intelligent Sensing and Planning of Unmanned Aerial Systems NEW	
Additional courses as approved by advisor		
Minimum Total Credit Hours for Post-Baccalaureate Students: 90		**90**
Minimum Total Credit Hours for Post-Master's Students: 60		**60**

1 Doctoral candidates, upon admission to candidacy, must register for ENGR 85199 for a total of 30 hours. It is expected that doctoral candidates will continuously register for ENGR 85199 and thereafter ENGR 85299, each semester, including one term each summer, until all requirements for the degree have been met.

2 Post-baccalaureate students may apply toward the 30 credit hours, a maximum 15 credit hours of coursework outside the College of Aeronautics and Engineering and 9 credit hours of research (maximum 18 credit hours total of research toward the degree).

Appendix B: Fiscal Impact Statement

	Year 1	Year 2	Year 3	Year 4
I. Projected Enrollment				
a. Headcount full-time (MS self or organizationally funded)	2	3	4	5
b. Headcount part-time (MS / PhD - Research and/or teaching supported)	5	8	11	15
c. Full-time equivalent (FTE) enrollment	5	8	11	14
II. Projected Program Income				
a. Tuition	$ 84,390	$ 144,415	$ 175,577	$ 188,282
b. Expected state subsidy (SSI)	$ 66,719	$ 157,222	$ 151,510	$ 203,535
c. Externally funded stipends, as applicable				
d. Other Income	$ 24,500	$ 37,000	$ 34,500	$ 42,000
Total Projected Program Income	**$ 175,609**	**$ 338,636**	**$ 361,586**	**$ 433,818**
III. Program Expenses				
a. New personnel:				
- 1. Instruction				
i. Full-time:	$ -	$ -	$ -	$ -
ii. Part-time: (2 to 6, 3-credit courses staffed)	$ 12,000	$ 24,600	$ 31,519	$ 38,768
- 2. Non-instruction				
i. Full-time:	$ -	$ -	$ -	$ -
ii. Part-time:	$ -	$ -	$ -	$ -
b. Current personnel:				
- 1. Instruction				
i. Full-time: (20% of 4 TT faculty)	$ 76,000	$ 77,900	$ 79,848	$ 81,844
ii. Part-time:	$ -	$ -	$ -	$ -
- 2. Non-instruction				
i. Full-time:	$ -	$ -	$ -	$ -
ii. Part-time:	$ -	$ -	$ -	$ -
c. Benefits for all personnel	$ 26,217	$ 28,817	$ 30,534	$ 32,319
d. New facilities/building/space renovation (describe in narrative below)	$ -	$ -	$ -	$ -
e. Scholarship/stipend support	$ -	$ -	$ -	$ -
f. Additional library resources	$ -	$ -	$ -	$ -
g. Additional technology or equipment needs	$ -	$ -	$ -	$ -
h. Other expenses (see below)	$ 91,577	$ 174,813	$ 186,940	$ 226,809
Total Projected Program Expenses	**$ 205,795**	**$ 306,130**	**$ 328,841**	**$ 379,740**
Projected Program Net	**$ (30,186)**	**$ 32,506**	**$ 32,745**	**$ 54,077**
As percentage of total income	-17%	10%	9%	12%
Other Expenses				
h.1. Allocation of expenses covered by general fee	$ -	$ -	$ -	$ -
h.2. RCM overhead - estimated at 50%	$ 75,554	$ 150,818	$ 163,543	$ 195,909
h.3. RCM tuition and SSI allocation to other colleges	$ 7,023	$ 15,995	$ 14,397	$ 19,900
h.4. Professional development	$ 2,000	$ 2,000	$ 2,000	$ 2,000
h.5. Supplies (office, computer software, duplication, printing)				
h.6.Telephone, network, and lines				
h.7. Other info and communication pool	$ 7,000	$ 6,000	$ 7,000	$ 9,000
Total Other Expenses	**$ 91,577**	**$ 174,813**	**$ 186,940**	**$ 226,809**

Kent State University

Fiscal Impact Statement

Aerospace Engineering Master of Science Degree and Doctor of Philosophy Degree

	Year 1	Year 2	Year 3	Year 4
I. Projected Enrollment				
a. Headcount full-time (MS self or organizationally funded)	2	3	4	5
b. Headcount part-time (MS / PhD - Research and/or teaching supported)	5	8	11	15
c. Full-time equivalent (FTE) enrollment	5	8	11	14
II. Projected Program Income				
a. Tuition	$ 84,390	$ 144,415	$ 175,577	$ 188,282
b. Expected state subsidy (SSI)	$ 66,719	$ 157,222	$ 151,510	$ 203,535
c. Externally funded stipends, as applicable				
d. Other Income	$ 24,500	$ 37,000	$ 34,500	$ 42,000
Total Projected Program Income	**$ 175,609**	**$ 338,636**	**$ 361,586**	**$ 433,818**
III. Program Expenses				
a. New personnel:				
- 1. Instruction				
i. Full-time:	$ -	$ -	$ -	$ -
ii. Part-time: (2 to 6, 3-credit courses staffed)	$ 12,000	$ 24,600	$ 31,519	$ 38,768
- 2. Non-instruction				
i. Full-time:	$ -	$ -	$ -	$ -
ii. Part-time:	$ -	$ -	$ -	$ -
b. Current personnel:				
- 1. Instruction				
i. Full-time: (20% of 4 TT faculty)	$ 76,000	$ 77,900	$ 79,848	$ 81,844
ii. Part-time:	$ -	$ -	$ -	$ -
- 2. Non-instruction				
i. Full-time:	$ -	$ -	$ -	$ -
ii. Part-time:	$ -	$ -	$ -	$ -
c. Benefits for all personnel	$ 26,217	$ 28,817	$ 30,534	$ 32,319
d. New facilities/building/space renovation (describe in narrative below)	$ -	$ -	$ -	$ -
e. Scholarship/stipend support	$ -	$ -	$ -	$ -
f. Additional library resources	$ -	$ -	$ -	$ -
g. Additional technology or equipment needs	$ -	$ -	$ -	$ -
h. Other expenses (see below)	$ 91,577	$ 174,813	$ 186,940	$ 226,809
Total Projected Program Expenses	**$ 205,795**	**$ 306,130**	**$ 328,841**	**$ 379,740**
Projected Program Net	**$ (30,186)**	**$ 32,506**	**$ 32,745**	**$ 54,077**
As percentage of total income	-17%	10%	9%	12%
Other Expenses				
h.1. Allocation of expenses covered by general fee	$ -	$ -	$ -	$ -
h.2. RCM overhead - estimated at 50%	$ 75,554	$ 150,818	$ 163,543	$ 195,909
h.3. RCM tuition and SSI allocation to other colleges	$ 7,023	$ 15,995	$ 14,397	$ 19,900
h.4. Professional development	$ 2,000	$ 2,000	$ 2,000	$ 2,000
h.5. Supplies (office, computer software, duplication, printing)				
h.6.Telephone, network, and lines				
h.7. Other info and communication pool	$ 7,000	$ 6,000	$ 7,000	$ 9,000
Total Other Expenses	**$ 91,577**	**$ 174,813**	**$ 186,940**	**$ 226,809**

BUDGET NARRATIVE: Aerospace Engineering Master of Science Degree and Doctor of Philosophy Degree

[This section is for describing facilities, scholarship/stipend support, library resources, additional technology, etc., if applicable.]

I.

a. Full Time: Refers to full time students in the MS program. These are anticipated to be self-funded or organizationally-funded individuals, who will complete a non-thesis MS.

b. Part Time: Refers to part time students in the MS and PhD programs. These are anticipated to be students seeking a PhD and / or thesis option MS. They are likely to be supported through work on sponsored research, university-funded research, and / or teaching activities.

c. FTE equals full time plus 60% of part time.

II.

a. All students treated as Ohio residents for tuition purposes. Includes tuition for all students, full time and part time in all courses CAE and others.

b. All students treated as Ohio residents for SSI purposes. If students are non-residents, the non-resident surcharge would increase the income, thus this is a conservative approach -- 50% of SSI is applicable to course completion is considered and 50% is applicable to graduation is considered only for years 3 & 4.

c. N/A

d. Reflects the portion of sponsored research indirect costs that come to CAE as a result of the activities under the direction of key faculty who will be engaging MS / PhD students from this program on research they lead.

III.

a.1.i No new personnel anticipated in the first four years. Use part time commitments of existing tenured and tenure-track faculty plus part time faculty.

a.1.ii Assumed rate: $6000 per 3-credit course, beginning with 2 courses in Year 1 and increasing to 6 courses in Year 4. Includes escalation arising from inflation.

a.2 No new non-instruction personnel anticipated. Use existing personnel within CAE.

b.1.i 20% of four existing TT faculty in any given semester. The faculty engaged will include those described in the proposal.

b.1.i 20% of four existing TT faculty.

b.2.i Use existing personnel within CAE. Normal duties will address this graduate program among others, so no specific amounts are allocated to this program, but exist within the current CAE budget.

b.2.ii N/A

c. Benefits - full time estimated at 32% of salary (medical at current value with basis salary of $95,000), part time at 15.81%.

d. Included in existing CAE budget.

e. Included in existing CAE budget.

f. Included in existing CAE budget.

g. New technology and equipment is anticipated to either be the same as for advanced undergraduate courses or procured as part of sponsored research, university supported research or using start up funding.

h.1 N/A

h.2 RCM overhead - estimated at 50% - Basis all (CAE + Other) tuition & SSI

h.3 RCM tuition and SSI allocation to other colleges - Total of Tuition & SSI earned by units other than CAE reduced 50% to address RCM

Appendix C: Letters of Support

Ohio Federal Research Network (OFRN)

August 1, 2019

Dr. Christina Bloebaum
Dean, College of Aeronautics & Engineering
1400 East Summit Street
Kent State University
Kent, Ohio 44242

Dear Dean Bloebaum:

I am writing this letter to support Kent State University's initiative to establish graduate programs in aerospace engineering. These programs are sorely needed in Northeastern Ohio to support the high concentration of aerospace-based companies and research agencies based here, which is second in the state of Ohio only to the Dayton-Cincinnati region.

The aerospace and defense industry is the top industry in the U.S. with a trade surplus that exceeded $90B in 2018. The state of Ohio is in the top 10% of states based upon the number of aerospace-related jobs and is the top state supplier to both Boeing and Airbus. The state has 540 aerospace and aviation companies.

These programs are a natural add-on to Kent State's aeronautics, engineering, and engineering technology undergraduate programs. With Kent State's proximity to NASA Glenn in Cleveland as well as industry and other non-aerospace research institutions in the region, there are countless opportunities for collaboration, innovation, and commercialization. Graduate programs like these ensure that Ohio maintains top-talent in this and similar fields.

I look forward to assisting and promoting this important initiative of the College of Aeronautics & Engineering and Kent State University.

Sincerely,

Dennis Andersh
Executive Director, OFRN

Lockheed Martin Corporation
1210 Massillon Road, Akron, OH 44315
Telephone 330.796.1262

LOCKHEED MARTIN

Dr. Christina Bloebaum
Dean, College of Aeronautics & Engineering
1400 East Summit Street
Kent State University
Kent, Ohio 44242

October 3, 2019

Dear Dean Bloebaum:

I am writing this letter to support Kent State University's initiative to establish graduate programs in aerospace engineering. The high concentration of aerospace-based companies and research agencies based in Northeast Ohio, second in the state of Ohio only to the Dayton-Cincinnati region, make such programs attractive to industry for recruiting new talent with advanced degrees.

The aerospace and defense industry is the top industry in the U.S. with a trade surplus that exceeded $90B in 2018. The state of Ohio is in the top state supplier to both Boeing and Airbus. The state has 540 aerospace and aviation companies, ranking number five in aerospace jobs according to the Bureau of Labor Statistics.

As an industry leader in global security and information technology, Lockheed Martin provides products and services that address some of the nation's most critical issues. But our contribution does not end with a commitment to support our country's needs and economic growth. Meeting the country's and our allies' needs would not be possible without the help of our 105,000 employees, many of whom are engineers. As a responsible corporate citizen, we also play an active role in helping to strengthen the quality of life in our country and the communities where we live and work.

As part of its efforts to educate and inspire tomorrow's scientists, engineers and mathematicians, Lockheed Martin's approach to STEM outreach and university support includes support for programs, events and campaigns that focus on student achievement and development, aerospace research initiatives, and gender and ethnic diversity.

The need for advanced talent coincides nicely with Kent State's aeronautics, engineering, and engineering technology undergraduate programs. Kent State's proximity to NASA Glenn in Cleveland as well as industry and other non-aerospace research institutions in the region provide numerous opportunities to ensure that Ohio maintains top-talent in this important industry of the American economy.

It is important to our company to have a well-prepared and diverse work force. Having additional talent pools in the Northeast Ohio region could benefit Lockheed Martin as well as other industry and government aerospace organizations.

Thank you,

Brian Neiss
Lockheed Martin Corporation
Engineering Manager

Date July 30, 2019

Dr. Christina Bloebaum
Dean, College of Aeronautics & Engineering
1400 East Summit Street
Kent State University
Kent, Ohio 44242

Dear Dean Bloebaum:

I am writing this letter to support Kent State University's initiative to establish graduate programs in aerospace engineering. These programs are sorely needed in Northeastern Ohio to support the high concentration of aerospace-based companies and research agencies based here, which is second in the state of Ohio only to the Dayton-Cincinnati region.

The aerospace and defense industry is the top industry in the U.S. with a trade surplus that exceeded $90B in 2018. The state of Ohio is in the top 10% of states based upon the number of aerospace-related jobs and is the top state supplier to both Boeing and Airbus. The state has 540 aerospace and aviation companies.

These programs are a natural add-on to Kent State's aeronautics, engineering, and engineering technology undergraduate programs. With Kent State's proximity to NASA Glenn in Cleveland as well as industry and other non-aerospace research institutions in the region, there are countless opportunities for collaboration, innovation, and commercialization. Graduate programs like these ensure that Ohio maintains top-talent in this and similar fields.

I look forward to assisting and promoting this important initiative of the College of Aeronautics & Engineering and Kent State University.

Sincerely,

Robert T Dirgo
Director Strategic Innovation
Meggitt Aircraft Braking Systems

Appendix D: Course Descriptions

Appendix E: Faculty CV

Institutional Staffing, Faculty and Student Support

1. **How many and what types of faculty (full and part time) will be employed in the program? Describe how number and type of faculty is sufficient to support the program (especially if the program contains a research or heavily mentored activity).**

   Over the past six years, the College of Aeronautics and Engineering has increased its engineering capabilities by increasing the number of faculty with engineering or closely-related backgrounds—from three full-time faculty members in 2013 to 14 full-time faculty members in 2019. The College will leverage our partnership with Ohio Aerospace Institute and NASA Glenn Research Center to augment instructional capacity as needed. Faculty for the proposed M.S. and Ph.D. degrees in Aerospace Engineering are listed below. Faculty CVs are in Appendix E.

Faculty Member	Terminal Degree	Courses Taught and/or Proposed
Ali Abdul-Aziz Associate Professor *Tenured*	Ph.D., Cleveland State University, 1985	AERN 55901/75901 Finite Element Method and Applications ENGR 52111/72111 Materials Selection in Design and Applications ENGR 52363/72363 Strength of Materials for Engineering
Christina Bloebaum Dean and Professor *Tenured*	Ph.D., University of Florida, 1991	AERN 55901/75901 Finite Element Method and Applications ENGR 57200 Systems Engineering AERN 61091 Aerospace Seminar ENGR 81091 Aerospace Seminar
Darwin Boyd Assistant Professor *Tenured*	Ph.D., Kent State University, 1991	ENGR 58005/78005 Linear System Analysis and Control ENGR 58007/78007 Digital Control Systems
Yanhai Du Associate Professor *Tenured*	Ph.D., The University of Waikato, 2004	ENGR 52111/72111 Materials Selection in Design and Applications ENGR 52363/72363 Strength of Materials for Engineering
Michael Fisch Associate Professor *Tenured*	Ph.D., Harvard University, 1981	ENGR 52111/72111 Materials Selection in Design and Applications ENGR 52363/72363 Strength of Materials for Engineering
Joycelyn Harrison Associate Dean and Professor *Tenured*	Ph.D., Georgia Institute of Technology, 1993	ENGR 52111/72111 Materials Selection in Design and Applications ENGR 52363/72363 Strength of Materials for Engineering AERN 61091 Aerospace Seminar ENGR 81091 Aerospace Seminar
Robert Kraus Associate Dean and Professor *Non-Tenure Track*	Ph.D., Virginia Polytechnic Institute and State University, 2010	AERN 61091 Aerospace Seminar ENGR 81091 Aerospace Seminar ENGR 58006/78006 Nonlinear Systems and Control ENGR 58007/78007 Digital Control Systems ENGR 58004/78004 Optimal Control Theory

Faculty Member	Terminal Degree	Courses Taught and/or Proposed
Kelsen LaBerge Associate Professor *Non-Tenure Track*	Ph.D., Case Western Reserve University, 2008	ENGR 52111/72111 Materials Selection in Design and Applications ENGR 52363/72363 Strength of Materials for Engineering
Rui Liu Assistant Professor *Tenure Track*	Ph.D., Colorado School of Mines, 2018	ENGR 58100/78100 Intelligent Sensing and Planning of Unmanned Aerial Systems ENGR 58200/78200 Autonomous Unmanned Aerial Systems
Ye Lu Assistant Professor *Tenure Track*	Ph.D., Purdue University, 2019	ENGR 58001/78001 Orbital Mechanics ENGR 58002/78002 Spacecraft Attitude Dynamics, Determination, and Control ENGR 58003/78003 Spacecraft Design
Maureen McFarland Associate Dean and Assistant Professor *Non-Tenure Track*	Ph.D., Kent State University, 2017	AERN 61091 Aerospace Seminar ENGR 81091 Aerospace Seminar ENGR 57200 Systems Engineering
Hossein Mirinejad Assistant Professor *Tenure Track*	Ph.D., University of Louisville, 2016	ENGR 58006/78006 Nonlinear Systems and Control ENGR 58007/78007 Digital Control Systems ENGR 58004/78004 Optimal Control Theory
Chang-Geun Oh Assistant Professor *Tenure Track*	Ph.D., Wright State University, 2015	AERN 65250 Applied Human Factors Engineering AERN 65280 Human Information Processing AERN 65270 Human Factors in Systems Design
Tao Shen Assistant Professor *Tenure Track*	Ph.D., University of Nebraska-Lincoln, 2016	ENGR 58005/78005 Linear System Analysis and Control ENGR 58006/78006 Nonlinear Systems and Control ENGR 58007/78007 Digital Control Systems
David (Blake) Stringer Associate Professor *Tenured*	Ph.D., University of Virginia, 2008	AERN 55700 Aircraft Design ENGR 57200 Systems Engineering ENGR 58100/78100 Intelligent Sensing and Planning of Unmanned Aerial Systems