

# AEROSPACE ENGINEERING - B.S.

College of Aeronautics and Engineering  
www.kent.edu/cae

## About This Program

Aerospace engineers are at the forefront of exciting advances in rockets, advanced air-mobility, drone development and logistics and advanced aircraft. Our program prepares students to contribute to these exciting developments through theoretical and practical courses; internships; group projects; and a multiple major, two-semester capstone experience. Read more...

## Contact Information

- cae@kent.edu | 330-672-2892
- Speak with an Advisor
- Chat with an Admissions Counselor

## Program Delivery

- **Delivery:**
  - In person
- **Location:**
  - Kent Campus

## Examples of Possible Careers and Salaries\*

### Aerospace engineers

- 2.8% slower than the average
- 66,400 number of jobs
- \$118,610 potential earnings

### Mechanical engineers

- 3.9% about as fast as the average
- 316,300 number of jobs
- \$90,160 potential earnings

### Architectural and engineering managers

- 2.6% slower than the average
- 198,100 number of jobs
- \$149,530 potential earnings

## Accreditation

The Bachelor of Science degree in Aerospace Engineering is accredited by the Engineering Accreditation Commission of ABET, www.abet.org, under the General Criteria and the Program Criteria for Aerospace Engineering and Similarly Named Programs.

\* Source of occupation titles and labor data comes from the U.S. Bureau of Labor Statistics' Occupational Outlook Handbook. Data comprises projected percent change in employment over the next 10 years; nation-wide employment numbers; and the yearly median wage at

which half of the workers in the occupation earned more than that amount and half earned less.

## Admission Requirements

The university affirmatively strives to provide educational opportunities and access to students with varied backgrounds, those with special talents and adult students who graduated from high school three or more years ago.

Admission to the Aerospace Engineering major is selective.

**New Students:** Admission into this major requires:

- Minimum 3.0 high school GPA
- Minimum 24 ACT composite score (minimum 24 ACT sub-scores in both English and math) or a minimum 1160 SAT score (minimum 580 sub-scores in both mathematics and evidence-based reading and writing) *effective for fall 2024 admission, scores are no longer required*
- Clear demonstration of an ability to be placed directly into MATH 12002 (or its equivalent); this will occur if the student is currently taking or has taken a calculus, pre-calculus or trigonometry course with a minimum C grade

**Note:** Admission to this program is contingent on students successfully placing into MATH 12002. Those who do not will have their major changed to **Aeronautical Systems Engineering Technology** prior to their freshman year.

Students who do not meet the above requirements for Aerospace Engineering will be admitted to the Aeronautical Systems Engineering Technology major, provided they meet the minimum program requirements.

**Current Students:** Students accepted into the Aeronautical Systems Engineering Technology major may request a change in major to Aerospace Engineering as soon as placement into MATH 12002 has been demonstrated (prior to the beginning of freshman year). Otherwise, students may request to change their major to Aerospace Engineering after their freshman year if they meet the following criteria:

- Minimum 3.200 overall Kent State GPA (*effective for fall 2024 admission, minimum 3.000 GPA will be required*)
- Minimum B grade in both MATH 12002 and PHY 23101 (*effective for fall 2024 admission, minimum C grade will be required*)

**International Students:** All international students must provide proof of English language proficiency unless they meet specific exceptions. For more information, visit the admissions website for international students.

**Transfer Students:** Admission into the Aerospace Engineering major requires the following:

- Minimum 12 credit hours in college-level coursework
- Minimum 3.200 overall GPA (*effective for fall 2024 admission, minimum 3.000 GPA will be required*)
- Minimum B grade in both MATH 12002 and PHY 23101 (or their equivalents) *effective for fall 2024 admission, minimum C grade will be required*

Transfer students who have completed fewer than 12 credit hours of college-level coursework will be evaluated on both collegiate and high school records and must submit a final high school transcript.

## Program Requirements

### Major Requirements

| Code   | Title   | Credit Hours |
|--|---|--------------|
| <b>Major Requirements (courses count in major GPA)</b> |   |              |
| AERN 35150   | AIRCRAFT STRUCTURES   | 3            |
| ENGR 11000   | INTRODUCTION TO ENGINEERING   | 3            |
| ENGR 13585   | COMPUTER AIDED ENGINEERING GRAPHICS   | 3            |
| ENGR 15300   | INTRODUCTION TO ENGINEERING ANALYSIS USING MATLAB®                                    | 2            |
| ENGR 15301   | INTRODUCTION TO ENGINEERING ANALYSIS USING MATLAB® LAB                                | 1            |
| ENGR 20000   | PROFESSIONAL DEVELOPMENT IN ENGINEERING   | 1            |
| ENGR 20002   | MATERIALS AND PROCESSES   | 3            |
| ENGR 25200   | STATICS (min C grade)   | 3            |
| ENGR 25400   | DYNAMICS (min C grade)  | 3            |
| ENGR 25500   | AERODYNAMICS FOR ENGINEERS I (min C grade)  | 3            |
| ENGR 33041   | CONTROL SYSTEMS   | 3            |
| ENGR 35200   | THERMAL FLUID ENGINEERING   | 3            |
| ENGR 35201   | THERMAL FLUID ENGINEERING LABORATORY  | 1            |
| ENGR 35300   | AIRCRAFT PERFORMANCE AND STABILITY I  | 3            |
| ENGR 35500   | SIGNALS AND CIRCUITS  | 3            |
| ENGR 35501   | SIGNALS AND CIRCUITS LABORATORY   | 1            |
| ENGR 35600   | AERODYNAMICS FOR ENGINEERS II   | 3            |
| ENGR 42111   | STRENGTH OF MATERIALS FOR ENGINEERS   | 3            |
| ENGR 42363   | MATERIALS SELECTION IN DESIGN AND APPLICATIONS  | 3            |
| ENGR 45121   | AEROSPACE PROPULSION FOR ENGINEERING  | 3            |
| ENGR 45600   | AIRCRAFT PERFORMANCE AND STABILITY II   | 3            |
| ENGR 45901   | INTRODUCTION TO FINITE ELEMENT METHOD AND APPLICATIONS                                | 3            |
| ENGR 48001   | ORBITAL MECHANICS   | 3            |
| ENGR 48099   | ENGINEERING CAPSTONE I (ELR) <sup>1</sup>   | 3            |
| ENGR 48199   | ENGINEERING CAPSTONE II (ELR) (WIC) <sup>1,2</sup>                                    | 3            |
| Specialization, choose from the following:             |   | 3            |
| <b>Engineering Internship</b>                          |   |              |
| CAE 45092  | AERONAUTICS AND ENGINEERING INTERNSHIP/COOPERATIVE EDUCATION (ELR) (WIC) <sup>2</sup> |              |
| <b>Undergraduate Research</b>                          |   |              |
| CAE 45096  | INDIVIDUAL INVESTIGATION IN AERONAUTICS AND ENGINEERING                               |              |
| <b>Space Applications</b>                              |   |              |
| ENGR 48002   | SPACECRAFT ATTITUDE DYNAMICS, DETERMINATION AND CONTROL                               |              |
| ENGR 48003   | SPACECRAFT DESIGN   |              |
| <b>Controls</b>  |   |              |
| ENGR 47400   | ROBOTICS: KINEMATICS AND DESIGN   |              |
| ENGR 48008   | INTRODUCTION TO ROBUST CONTROL  |              |
| <b>Systems Engineering and Optimization</b>            |   |              |
| ENGR 42410   | ENGINEERING OPTIMIZATION  |              |
| ENGR 47200   | SYSTEMS ENGINEERING   |              |
| <b>Materials</b>                                       |   |              |
| ENGR 42710 & ENGR 42711                                | ADDITIVE MANUFACTURING and ADDITIVE MANUFACTURING LABORATORY                          |              |
| Patent and Engineering Law                             |   |              |

|  |  |            |
|--|--|------------|
| ENGR 35550   | LAW AND ETHICS FOR ENGINEERS   |            |
| <b>Additional Requirements (courses do not count in major GPA)</b> |  |            |
| CHEM 10060   | GENERAL CHEMISTRY I (KBS)  | 4          |
| ECON 22060   | PRINCIPLES OF MICROECONOMICS (KSS)   | 3          |
| MATH 12002   | ANALYTIC GEOMETRY AND CALCULUS I (KMCR) <sup>3</sup>   | 5          |
| MATH 12003   | ANALYTIC GEOMETRY AND CALCULUS II  | 5          |
| PHY 23101  | GENERAL UNIVERSITY PHYSICS I (KBS) (KLAB)  | 5          |
| PHY 23102  | GENERAL UNIVERSITY PHYSICS II (KBS) (KLAB)   | 5          |
| UC 10001   | FLASHES 101  | 1          |
| Mathematics Electives, choose from the following:                  |  | 8-10       |
| MATH 21001 & MATH 22005 & MATH 32044                               | LINEAR ALGEBRA and ANALYTIC GEOMETRY AND CALCULUS III and ORDINARY DIFFERENTIAL EQUATIONS            |            |
| MATH 32051 & MATH 32052  | MATHEMATICAL METHODS IN THE PHYSICAL SCIENCES I and MATHEMATICAL METHODS IN THE PHYSICAL SCIENCES II |            |
| Kent Core Composition  |  | 6          |
| Kent Core Humanities and Fine Arts (minimum one course from each)  |  | 9          |
| Kent Core Social Sciences (must be from two disciplines)           |  | 3          |
| Kent Core Additional   |  | 1          |
| <b>Minimum Total Credit Hours:</b>                                 |  | <b>124</b> |

<sup>1</sup> ENGR 48099 and ENGR 48199 must be taken during the same academic year.

<sup>2</sup> A minimum C grade must be earned to fulfill the writing-intensive requirement.

<sup>3</sup> Applicants to this program should understand that this is a math-intensive program. Students admitted to the program are expected to demonstrate prerequisite knowledge on a math placement exam (the ALEKS exam) prior to starting their first semester. Students who do not obtain the minimum score required to place into MATH 12002 prior to the start of their first semester will have their major changed to Aeronautical Systems Engineering Technology until they satisfy the requirements to change back to this program.

## Graduation Requirements

| Minimum Major GPA | Minimum Overall GPA |
|-------------------|---------------------|
| 2.750             | 2.500               |

## Roadmap

This roadmap is a recommended semester-by-semester plan of study for this major. However, courses designated as critical (!) must be completed in the semester listed to ensure a timely graduation.

| Semester One          |  | Credits   |
|-----------------------|--|-----------|
| ENGR 11000            | INTRODUCTION TO ENGINEERING                            | 3         |
| ENGR 15300            | INTRODUCTION TO ENGINEERING ANALYSIS USING MATLAB®     | 2         |
| ENGR 15301            | INTRODUCTION TO ENGINEERING ANALYSIS USING MATLAB® LAB | 1         |
| ! MATH 12002          | ANALYTIC GEOMETRY AND CALCULUS I (KMCR)                | 5         |
| UC 10001              | FLASHES 101  | 1         |
| Kent Core Requirement |  | 3         |
| <b>Credit Hours</b>   |  | <b>15</b> |

|                                    |  |            |
|------------------------------------|--|------------|
| <b>Semester Two</b>                |  |            |
| CHEM 10060                         | GENERAL CHEMISTRY I (KBS)                              | 4          |
| ENGR 13585                         | COMPUTER AIDED ENGINEERING GRAPHICS                    | 3          |
| ! MATH 12003                       | ANALYTIC GEOMETRY AND CALCULUS II                      | 5          |
| ! PHY 23101                        | GENERAL UNIVERSITY PHYSICS I (KBS) (KLAB)              | 5          |
| <b>Credit Hours</b>                |  | <b>17</b>  |
| <b>Semester Three</b>              |  |            |
| ENGR 20000                         | PROFESSIONAL DEVELOPMENT IN ENGINEERING                | 1          |
| ! ENGR 25200                       | STATICS  | 3          |
| ! PHY 23102                        | GENERAL UNIVERSITY PHYSICS II (KBS) (KLAB)             | 5          |
| ! Mathematics Elective             |  | 3-4        |
| Kent Core Requirement              |  | 3          |
| <b>Credit Hours</b>                |  | <b>16</b>  |
| <b>Semester Four</b>               |  |            |
| ECON 22060                         | PRINCIPLES OF MICROECONOMICS (KSS)                     | 3          |
| ENGR 20002                         | MATERIALS AND PROCESSES                                | 3          |
| ! ENGR 25400                       | DYNAMICS   | 3          |
| ! ENGR 25500                       | AERODYNAMICS FOR ENGINEERS I                           | 3          |
| ! Mathematics Elective             |  | 4          |
| <b>Credit Hours</b>                |  | <b>16</b>  |
| <b>Semester Five</b>               |  |            |
| ENGR 35200                         | THERMAL FLUID ENGINEERING                              | 3          |
| ENGR 35201                         | THERMAL FLUID ENGINEERING LABORATORY                   | 1          |
| ENGR 35500                         | SIGNALS AND CIRCUITS                                   | 3          |
| ENGR 35501                         | SIGNALS AND CIRCUITS LABORATORY                        | 1          |
| ! ENGR 35600                       | AERODYNAMICS FOR ENGINEERS II                          | 3          |
| ENGR 42111                         | STRENGTH OF MATERIALS FOR ENGINEERS                    | 3          |
| Mathematics Elective               |  | 0-3        |
| <b>Credit Hours</b>                |  | <b>14</b>  |
| <b>Semester Six</b>                |  |            |
| ENGR 33041                         | CONTROL SYSTEMS  | 3          |
| ! ENGR 35300                       | AIRCRAFT PERFORMANCE AND STABILITY I                   | 3          |
| ENGR 42363                         | MATERIALS SELECTION IN DESIGN AND APPLICATIONS         | 3          |
| ENGR 45121                         | AEROSPACE PROPULSION FOR ENGINEERING                   | 3          |
| Kent Core Requirement              |  | 3          |
| <b>Credit Hours</b>                |  | <b>15</b>  |
| <b>Semester Seven</b>              |  |            |
| AERN 35150                         | AIRCRAFT STRUCTURES                                    | 3          |
| ! ENGR 45600                       | AIRCRAFT PERFORMANCE AND STABILITY II                  | 3          |
| ! ENGR 48099                       | ENGINEERING CAPSTONE I (ELR)                           | 3          |
| Specialization                     |  | 3          |
| Kent Core Requirement              |  | 3          |
| <b>Credit Hours</b>                |  | <b>15</b>  |
| <b>Semester Eight</b>              |  |            |
| ! ENGR 45901                       | INTRODUCTION TO FINITE ELEMENT METHOD AND APPLICATIONS | 3          |
| ! ENGR 48001                       | ORBITAL MECHANICS                                      | 3          |
| ! ENGR 48199                       | ENGINEERING CAPSTONE II (ELR) (WIC)                    | 3          |
| Kent Core Requirement              |  | 3          |
| Kent Core Requirement              |  | 3          |
| Kent Core Requirement              |  | 1          |
| <b>Credit Hours</b>                |  | <b>16</b>  |
| <b>Minimum Total Credit Hours:</b> |  | <b>124</b> |

## University Requirements

All students in a bachelor's degree program at Kent State University must complete the following university requirements for graduation.

**NOTE:** University requirements may be fulfilled in this program by specific course requirements. Please see Program Requirements for details.

|  |                    |
|--|--------------------|
| Flashes 101 (UC 10001)   | 1 credit hour      |
| Course is not required for students with 30+ transfer credits (excluding College Credit Plus) or age 21+ at time of admission. |                    |
| Diversity Domestic/Global (DIVD/DIVG)  | 2 courses          |
| Students must successfully complete one domestic and one global course, of which one must be from the Kent Core.               |                    |
| Experiential Learning Requirement (ELR)  | varies             |
| Students must successfully complete one course or approved experience.   |                    |
| Kent Core (see table below)  | 36-37 credit hours |
| Writing-Intensive Course (WIC)   | 1 course           |
| Students must earn a minimum C grade in the course.  |                    |
| Upper-Division Requirement   | 39 credit hours    |
| Students must successfully complete 39 upper-division (numbered 30000 to 49999) credit hours to graduate.                      |                    |
| Total Credit Hour Requirement  | 120 credit hours   |

## Kent Core Requirements

|   |              |
|---|--------------|
| Kent Core Composition (KCOMP)                                       | 6            |
| Kent Core Mathematics and Critical Reasoning (KMCR)                 | 3            |
| Kent Core Humanities and Fine Arts (KHUM/KFA) (min one course each) | 9            |
| Kent Core Social Sciences (KSS) (must be from two disciplines)      | 6            |
| Kent Core Basic Sciences (KBS/KLAB) (must include one laboratory)   | 6-7          |
| Kent Core Additional (KADL)   | 6            |
| <b>Total Credit Hours:</b>  | <b>36-37</b> |

## Program Learning Outcomes

Graduates of this program will be able to:

1. Identify, formulate and solve complex engineering problems by applying principles of engineering, science and mathematics.
2. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety and welfare, as well as global, cultural, social, environmental and economic factors.
3. Communicate effectively with a range of audiences.
4. Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental and societal contexts.
5. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks and meet objectives.
6. Develop and conduct appropriate experimentation, analyze and interpret data and use engineering judgment to draw conclusions.

7. Acquire and apply new knowledge as needed, using appropriate learning strategies.

## Full Description

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

Applicants to this program should understand that this is a math-intensive program.

Information on the program's education objectives, objectives and student enrollment, and enrollment and graduation data can be found on the college website.

Students may apply early to the M.S. degree in Aerospace Engineering and double count 9 credit hours of graduate courses toward both degree programs. See the Combined Bachelor's/Master's Degree Program policy in the University Catalog for more information.