

# Bachelor of Science in Aerospace Engineering

The focus of the BS program in Aerospace Engineering is the design of aerospace vehicles and components. This is accomplished in a four-year academic program that consists in the first year of basic sciences, mathematics, and communication courses. These courses form the key foundation for the rest of the program. Also, you will take an Introduction to Aerospace Engineering course that will give you an overview of the BS program. In the second year, you will continue to take basic mathematics and science as well as engineering science courses. The engineering science courses apply the principles you have mastered in the basic sciences and mathematics to the solution of engineering problems. In the third year, you learn the unique nature of aerospace problems. These courses cover the major subdomains of Aerospace Engineering - fluid mechanics and aerodynamics, propulsion, structures, and flight dynamics. You will also have courses in complementary topics including computer graphics and instrumentation. In your fourth year, you have the opportunity to explore how all the individual specialized subdomain technologies are used to design an aerospace vehicle.

## Professional Development

The aerospace engineer is concerned with the design, production, operation, and support of aircraft and spacecraft. Aerospace engineers conduct research to advance air flight and space exploration, by solving problems, developing products, and improving processes for the aerospace industry. Aerospace engineers typically work for aircraft and space vehicle industries, national research laboratories, commercial airlines, and federal government agencies. The curriculum includes traditional courses in aerodynamics, flight dynamics and control, propulsion, structures, manufacturing, instrumentation, and spacecraft systems.

## Objectives

The Aerospace Engineering undergraduate program objective is that our graduates contribute to the aerospace profession, related fields and other disciplines through skilled professional practice in industry, government and/or graduate study. Within a few years after graduation we expect that:

- Graduates are meaningfully employed or pursuing graduate study in aerospace or other high technology fields, with the majority retained in aerospace and closely related engineering
- Graduates have a positive professional career path including promotions, leadership, and/or continued education
- Graduates recognize the value of their educational preparation for their current and future professional endeavors.

## Educational Outcomes

Our program is designed to achieve our objective by establishing measurable learning outcomes, which graduates of the program must demonstrate:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to 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. an ability to communicate effectively with a range of audiences
4. an ability to 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. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

## Undergraduate Admission to the School of Engineering

Admission to the KU School of Engineering and its degree programs is selective. Students may be admitted to an engineering or computer science degree program (<https://enr.ku.edu/admission-requirements/>) as freshmen (first-year) students, but all admissions, for both in-state and out-of-state students, are selective. Applications are judged on several factors, such as high school record, scores on national tests, academic record at college or university level, and trend of grades and more. High school transcripts are required.

## Freshman Admission Standards to the School of Engineering

To be considered for admission to the School of Engineering, beginning freshmen (first-year) students must meet or exceed the following minimum standards:

- Must be admissible (<https://admissions.ku.edu/major-specific-requirements/>) to the University of Kansas by assured admissions or individual review, **AND**
- Have a 3.0+ high school GPA, **AND**
- Demonstrate mathematics preparedness by:
  - Obtaining a mathematics ACT score of 22+ (or math SAT score of 540+), OR
  - Achieving a B or better in college algebra or a more advanced mathematics course, OR
  - Achieving a C or better in a high school calculus course; OR
  - Earning credit via IB or AP credit for the above-mentioned courses in accordance with KU placement credit requirements; OR
  - Achieving at minimum a qualifying score for MATH 104 on the ALEKS mathematics placement exam.

## Pre-Engineering

Students not admitted directly to the School of Engineering and their department but who are admissible to the university may be admitted to the College of Liberal Arts and Sciences as a pre-engineering student. They can later re-apply to the School of Engineering during the semester they are completing the admission requirements for current students at KU.

## Transfer Student Admission Standards to the School of Engineering

Applications from all transfer students, whether from other institutions or from other academic schools at the University of Kansas, are evaluated on a case-by-case basis. Transfer students must:

- Be admissible (<http://admissions.ku.edu/apply/requirements/ustransfer/>) to KU, **AND**
- Earn a cumulative college transferable grade-point average of 2.5+, **AND**
- Earn a grade of C or better in MATH 125 (Calculus I, or its direct equivalent), **AND**
- Earn grades of C or better in math, science, and engineering courses applicable to the engineering degree.

Students must also complete their last 30 hours of credit at KU (<http://policy.ku.edu/governance/FSRR/#art4sect5>). For more information on transfer credits, see KU Undergraduate Admissions (<https://admissions.ku.edu/i-am/transfer/>).

## Current Student Admission Standards to the School of Engineering

Students who are currently enrolled at KU, need to meet the following:

- Earn a 2.5+ KU GPA, **AND**
- Earn a grade of C or better in MATH 125 (Calculus I, or its direct equivalent), **AND**
- Earn a grade of C or better in all math, science, and engineering courses.

Current KU Students admitted to other academic units may apply to the School of Engineering by completing a Change of School form (<https://inowformsprivate.ku.edu/imagenowforms/fs/?form=OUR%20Change%20of%20School%20Form>). Per University Registrar deadlines for processing, Change of School applications each semester are processed up until the 20th day of classes. If received and processed after the 20th day of classes, students will be active in the new program the following semester.

## Already Applied to KU, But Not Engineering?

Don't worry. It's not too late to change your mind if you've already applied to KU and selected a major outside the School of Engineering. If you think one of the 12 engineering or computer science majors is a better fit for your talents, you can still change your requested major — preferably before May 1 — and be considered for admission to the School of Engineering and all the benefits that go with it.

To update your application, visit Undergraduate Admissions (<http://admissions.ku.edu/update-your-application/>) and click on "Change application term, major, mailing address, and/or email address."

Please contact a member of our recruitment team ([studyengineering@ku.edu](mailto:studyengineering@ku.edu)), 785-864-3881, if you have any difficulty.

## Application Deadlines For New Freshman and Transfer Applicants

November 1                      Priority scholarship deadline for incoming freshmen.

December 1	Deadline to apply for the Self Engineering Leadership Fellows Program for incoming freshmen.
May 1	Enrollment Deposit due.
Last Friday in October	Deadline to submit Change of School applications for fall semester admission.
Last Friday in March	Deadline to submit Change of School applications for spring semester admission.

## Bachelor of Science in Aerospace Engineering Degree Requirements

The typical number of credit hours required for a Bachelor's of Science in Aerospace Engineering is 129 hours.

Code	Title	Hours
<b>Core 34 General Education</b>		
Select courses to meet Core 34 General Education requirements.		24
Core 34 courses that also meet Aerospace Engineering degree requirements:		
ECON 142 or ECON 144 or ECON 104	Principles of Microeconomics (Core 34: Social and Behavioral Science (SGE)) <sup>050</sup> Principles of Macroeconomics Introductory Economics	3
<b>Mathematics Courses</b>		
MATH 125 or MATH 145 or MATH 115 & MATH 116	Calculus I (Core 34: Math and Statistics (SGE)) <sup>030</sup> Calculus I, Honors Calculus I and Calculus II	4
MATH 126 or MATH 146	Calculus II Calculus II, Honors	4
MATH 127 or MATH 147	Calculus III Calculus III, Honors	4
MATH 220 or MATH 221 or MATH 320	Applied Differential Equations Applied Differential Equations, Honors Elementary Differential Equations	3
MATH 290 or MATH 291	Elementary Linear Algebra Elementary Linear Algebra, Honors	2
<b>Science Courses</b>		
CHEM 150 or CHEM 130 & CHEM 149 or CHEM 130 & CHEM 135	Chemistry for Engineers <sup>C</sup> General Chemistry I and Chemistry for Engineers Supplement General Chemistry I and General Chemistry II	5
EPHX 210 or PHSX 211 or PHSX 213	General Physics I for Engineers (Core 34: Natural and Physical Science (SGE)) <sup>040</sup> General Physics I General Physics I Honors	3

PHSX 216	General Physics I Laboratory (Core 34: Natural and Physical Science (SGE) ) <sup>040</sup>	1
or PHSX 213	General Physics I Honors	
or PHSX 114	College Physics I	
PHSX 212	General Physics II	3
or PHSX 214	General Physics II Honors	
PHSX 236	General Physics II Laboratory	1
or PHSX 214	General Physics II Honors	
or PHSX 115	College Physics II	

**Engineering Science Courses**

AE 211	Computing for Engineers	3
or EECS 138	Introduction to Computing: _____	
or EECS 168	Programming I	
or EECS 169	Programming I: Honors	
or ME 208	Introduction to Digital Computational Methods in Mechanical Engineering	
CE 260	Statics and Dynamics	5
or CE 201	Statics	
& CE 250	and Dynamics	
CE 310	Strength of Materials	3
or CE 312	Strength of Materials, Honors	
ME 212	Basic Engineering Thermodynamics	3

**Aerospace Engineering Courses**

AE 245	Introduction to Aerospace Engineering	3
AE 290	Aerospace Colloquium (Must take 8 semesters of AE 290 for 2 credit hours total)	2
AE 345	Fluid Mechanics	3
AE 360	Introduction to Astronautics	3
AE 421	Aerospace Computer Graphics	3
or ME 228	Computer Graphics	
AE 430	Aerospace Instrumentation Laboratory	3
AE 445	Aircraft Aerodynamics and Performance	3
AE 507	Aerospace Structures I	3
or AE 506	Aerospace Structures I, Honors	
AE 508	Aerospace Structures II	3
or AE 509	Honors Aerospace Structures II	
AE 510	Aerospace Materials and Processes	3
AE 545	Fundamentals of Aerodynamics	3
or AE 546	Aerodynamics, Honors	
AE 550	Dynamics of Flight I	3
AE 551	Dynamics of Flight II	3
or AE 552	Honors Dynamics of Flight II	
AE 571	Fundamentals of Airplane Reciprocating Propulsion Systems	3
AE 572	Fundamentals of Jet Propulsion	3
or AE 573	Honors Propulsion	
AE 590	Aerospace Senior Seminar	1

**Aerospace Capstone Design (Fulfills KU Capstone)**

Select one of the following Capstone Design I options:		4
AE 520	Space Systems Design I	
AE 521	Aerospace Systems Design I	
Select one of the following Capstone Design II options:		3
AE 522	Aerospace Systems Design II	

AE 523	Space Systems Design II
AE 721	Aircraft Design Laboratory I
AE 722	Aircraft Design Laboratory II

**Technical Electives**

Technical Electives are selected from 500-level and above aerospace engineering courses with the exception of AE 500, or 600-level and above courses from other engineering departments, or 500-level and above math courses. At least 3 credit hours must be a 700-level aerospace course or AE 592 or AE 593.

**Total Hours** **129**

**Credit for ROTC Courses:** A student enrolled in one of the ROTC programs can receive 3 hours of technical electives if the ROTC program is completed.

**Requirements for Enrollment in Junior-Level Aerospace Courses**

Enrollment in junior-level aerospace courses is limited to students who have received grades of C- or higher in all first- and second-year courses in mathematics, physics, ME 212, CE 260, CE 310 or CE 312, AE 211, AE 245, AE 345, and AE 445.

**Four Year Degree Completion Plan**

The following are recommended enrollments:

**Freshman**

Fall	Hours Spring	Hours
AE 245	3 AE 211	3
AE 290	0.25 AE 290	0.25
MATH 125 (Core 34: Math and Statistics (SGE)) <sup>030*** H</sup>	4 MATH 126 <sup>H</sup>	4
CHEM 150 <sup>C</sup>	5 EPHX 210 or PHSX 211 (Core 34: Natural and Physical Sciences (SGE)) <sup>040***</sup>	3
Core 34: English (SGE) <sup>010</sup>	3 PHSX 216 (Core 34: Natural and Physical Sciences (SGE)) <sup>040***</sup>	1
	Core 34: English (SGE) <sup>010 K</sup>	3
	ECON 104, 142, or 144 (Core 34: Social and Behavioral Science (SGE)) <sup>050*** H</sup>	3
<b>15.25</b>		<b>17.25</b>

**Sophomore**

Fall	Hours Spring	Hours
AE 290	0.25 AE 290	0.25
AE 345	3 AE 360	3
CE 260	5 AE 445	3
MATH 220 <sup>H</sup>	3 MATH 127 <sup>H</sup>	4
PHSX 212	3 CE 310 <sup>H</sup>	3
PHSX 236	1 ME 212	3
Core 34: Social and Behavior Science (SGE) <sup>050</sup>	3	
<b>18.25</b>		<b>16.25</b>

**Junior**

Fall	Hours Spring	Hours
AE 290	0.25 AE 290	0.25
AE 507 <sup>H</sup>	3 AE 421	3
AE 550	3 AE 508 <sup>H</sup>	3
AE 545 <sup>H</sup>	3 AE 551 <sup>H</sup>	3
AE 571	3 AE 572 <sup>H</sup>	3
MATH 290 <sup>H</sup>	2 Core 34: Arts and Humanities (SGE) <sup>060</sup>	3
Core 34: Communications (SGE) <sup>020</sup>	3	
<b>17.25</b>		<b>15.25</b>

**Senior**

Fall	Hours Spring	Hours
AE 290	0.25 AE 290	0.25
AE 510	3 AE 430	3
AE 590	1 AE 522 or 523 (Capstone)	3
AE 520 or 521	4 Technical Elective <sup>T</sup>	3
Technical Elective <sup>T</sup>	3 Core 34: US Culture (SGE) <sup>070</sup>	3
Core 34: Arts and Humanities (SGE) <sup>060</sup>	3 Core 34: Global Culture (SGE) <sup>070</sup>	3
<b>14.25</b>		<b>15.25</b>

**Total Hours 129**

<sup>H</sup> Honors equivalent course is available

<sup>C</sup> Students with credit for CHEM 130 must take CHEM 149 to meet the CHEM 150 requirement

<sup>T</sup> Technical Electives are selected from 500-level and above aerospace engineering courses, with the exception of AE 500, 600-level and above courses from other engineering departments, or 500-level and above MATH courses. At least 3 credit hours must be a 700-level aerospace course or AE 592 or AE 593.

**Notes:**

\* - This course is a Required major course and is also part of Core 34: Systemwide General Education. If this course is not taken to fulfill the Core 34:SGE requirement, it must be taken in place of elective hours.

\*\* - This course is a Recommended Core 34: Systemwide General Education course. This specific course is not required but is recommended by the program's faculty.

\*\*\* - This course is a Required Core 34: Systemwide General Education course. This program is approved by the Kansas Board of Regents to require this specific Core 34: Systemwide General Education course. If a student did not take this course it must be taken in addition to other degree requirements.

At the completion of this program, students 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.

**Departmental Honors**

To complete the departmental honors program, an aerospace engineering undergraduate student must

- Graduate with a KU grade-point average of 3.5.
- Take at least 2 departmental honors courses and earn a grade of B or better in each. At least one course of which must include an independent research component
  - An AE 700-level technical elective can be used for one of these courses
- The departmental honors courses are

Code	Title	Hours
AE 506	Aerospace Structures I, Honors	3
AE 509	Honors Aerospace Structures II	3
AE 546	Aerodynamics, Honors	3
AE 552	Honors Dynamics of Flight II	3
AE 573	Honors Propulsion	3
AE 593	Honors Research	1-5

Students require permission of instructor to enroll in honors courses. The Application for Departmental Honors (<https://deptsec.ku.edu/~enr/forms/form/50/>) form must be completed by April 1 during the year of graduation in order to be recognized.