

AEROSPACE ENGINEERING, B.S.

Begin Campus: Any Penn State Campus

End Campus: University Park

Program Description

This major emphasizes the analysis, design, and operation of aircraft and spacecraft. Students learn the theories and practices in the fundamental subjects of aeronautics, astronautics, aerodynamics and fluid dynamics, aerospace materials and structures, dynamics and automatic control, aircraft stability and control and/or orbital and attitude dynamics and control, air-breathing and rocket propulsion, aircraft systems design and /or spacecraft systems design. All of these place significant weight on the development and use of teamwork and communications skills for effective problem-solving. Graduates in aerospace engineering find employment in the customary settings such as government laboratories, large and small aerospace firms, and in nontraditional positions that also require the use of systems-engineering approaches to problem-solving; they can also pursue graduate study in aerospace engineering and related fields.

What is Aerospace Engineering?

Aerospace engineering is the primary field of engineering concerned with the design, development, testing, and production of aircraft, spacecraft, and related systems and equipment. The field has traditionally focused on problems related to atmospheric and space flight, with two major and overlapping branches: aeronautical engineering and astronautical engineering. Aerospace engineers develop leading-edge technologies and integrate them into aerospace vehicle systems used for transportation, communications, exploration, and defense applications. This involves the design and manufacturing of aircraft, spacecraft, propulsion systems, satellites, and missiles, as well as the design and testing of aircraft and aerospace products, components, and subassemblies. Successful aerospace engineers possess in-depth skills in, and an understanding of, aerodynamics, materials and structures, propulsion, vehicle dynamics and control, and software.

You Might Like This Program If...

- You are interested in developing leading-edge technologies and integrating them into aerospace vehicle systems used for transportation, communications, exploration, and defense applications.
- You want to obtain a solid understanding of the foundations of aerospace systems: aerodynamics, structures, propulsion, dynamics and controls, and software, as well as unmanned air vehicles (UAVs), nano-materials, autonomous systems, and wind energy.
- You want to develop professional excellence, engineering thinking, and gain deep technical knowledge in the core disciplines and integrative systems of aerospace engineering through an innovative curriculum and world-class instruction.
- You want to make a significant global impact.

Entrance to Major

This program currently has administrative enrollment controls. Administrative Enrollment Controls are initiated when limitations of space, faculty, or other resources in a major prevent accommodating all

students who request them. Students must follow the administrative enrollment controls that are in effect for the semester that they enter the university.

First-Year Students Entering Summer 2025, Fall 2025, Spring 2026

In order to be eligible for entrance to this major, students must satisfy the following requirements:

- be enrolled in the College of Engineering or the Division of Undergraduate Studies
- 29-55 graded Penn State credits (excludes transfer and AP credits)
- completed with a grade of C or better: CHEM 110, EDSGN 100, MATH 140, MATH 141, PHYS 211
- earned a minimum cumulative grade-point average (GPA) of 3.00

Students Who Entered Prior to Summer 2025

Students who entered the University from Summer 2018 through Spring 2025 should view the administrative enrollment controls in the appropriate Undergraduate Bulletin archive (<https://bulletins.psu.edu/undergraduate/archive/>). Students who entered the University prior to the summer 2018 semester should consult with their academic adviser about the administrative enrollment controls in effect for the semester they entered the university.

Degree Requirements

For the Bachelor of Science degree in Aerospace Engineering, a minimum of 131 credits is required:

Requirement	Credits
General Education	45
Requirements for the Major	113-117

27 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 9 credits of GWS courses. The remaining 18 General Education credits must be distinct from the Requirements for the Major.

The first two years of study are similar to those in other engineering majors and provide students with a basic education for the engineering profession. Students need to complete EMCH 212, CMPSC 121 or CMPSC 131 or CMPSC 200 or CMPSC 201, MATH 220, MATH 230, and MATH 250 or MATH 251 prior to the start of the junior year in order to meet graduation requirements in the following two years. Six of the nine technical-elective credits taken in the senior year must be aerospace engineering courses.

Requirements for the Major

To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (<https://senate.psu.edu/students/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/>).

Code	Title	Credits
Prescribed Courses		
AERSP 304	Dynamics and Control of Aerospace Systems	3
AERSP 305W	Aerospace Technology Laboratory	3
AERSP 312	Aerodynamics II	3

AERSP 410	Aerospace Propulsion	3
EMCH 315	Mechanical Response of Engineering Materials	2
EMCH 316	Experimental Determination of Mechanical Response of Materials	1
MATH 220	Matrices	2-3
MATH 230	Calculus and Vector Analysis	4
ME 201	Introduction to Thermal Science	3
PHYS 214	General Physics: Wave Motion and Quantum Physics	2

Prescribed Courses: Require a grade of C or better

AERSP 301	Aerospace Structures	3
AERSP 306	Aeronautics	3
AERSP 309	Astronautics	3
AERSP 311	Aerodynamics I	3
AERSP 313	Aerospace Analysis	3
CHEM 110	Chemical Principles I	3
EDSGN 100	Cornerstone Engineering Design	3
EMCH 212	Dynamics	3
ENGL 202C	Effective Writing: Technical Writing	3
MATH 140	Calculus With Analytic Geometry I	4
MATH 141	Calculus with Analytic Geometry II	4
PHYS 211	General Physics: Mechanics	4
PHYS 212	General Physics: Electricity and Magnetism	4

Additional Courses

Select 1 credit of First-Year Seminar	1
AERSP 413 Stability and Control of Aircraft or AERSP 450 Orbit and Attitude Control of Spacecraft	3

Select 3 credits from the following: 3

CMPSC 121	Introduction to Programming Techniques
CMPSC 131	Programming and Computation I: Fundamentals
CMPSC 200	Programming for Engineers with MATLAB
CMPSC 201	Programming for Engineers with C++

Select 3 credits from the following: 3

ECON 102	Introductory Microeconomic Analysis and Policy
ECON 104	Introductory Macroeconomic Analysis and Policy
ECON 14	Principles of Economics

Select 5-6 credits of the following: 5-6

EMCH 210	Statics and Strength of Materials
EMCH 211 & EMCH 213	Statics and Strength of Materials

Select one of the following sequences: 5

AERSP 401A & AERSP 401B	Spacecraft Design—Preliminary and Spacecraft Design—Detailed
AERSP 402A & AERSP 402B	Aircraft Design—Preliminary and Aircraft Design—Detailed

Select 3-4 credits from the following: 3-4

AERSP 424	Advanced Computer Programming
EE 210	Circuits and Devices
EE 212	Introduction to Electronic Measuring Systems

Additional Courses: Require a grade of C or better

CAS 100A or CAS 100B	Effective Speech	3
ENGL 15	Rhetoric and Composition	3

or ENGL 30H	Honors Rhetoric and Composition	
MATH 250 or MATH 251	Ordinary Differential Equations Ordinary and Partial Differential Equations	3-4

Supporting Courses and Related Areas

Select 6 credits of Aerospace Technical Elective (ATE) courses from department list 6

Select 3 credits of General Technical Elective (GTE) courses from department list 3

Select 3 credits of Limited Elective (LE) courses from department list 3

¹ Students who complete Basic ROTC may substitute 6 of the ROTC credits for 3 credits of LE and 3 credits of GHW.

General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (<https://bulletins.psu.edu/undergraduate/general-education/baccalaureate-degree-general-education-program/>) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required and Inter-Domain courses do not meet this requirement.)

- **Quantification (GQ):** 6 credits
- **Writing and Speaking (GWS):** 9 credits

Breadth in the Knowledge Domains (Inter-Domain courses do not meet this requirement.)

- **Arts (GA):** 3 credits
- **Health and Wellness (GHW):** 3 credits
- **Humanities (GH):** 3 credits
- **Social and Behavioral Sciences (GS):** 3 credits
- **Natural Sciences (GN):** 3 credits

Integrative Studies

- **Inter-Domain Courses (Inter-Domain):** 6 credits

Exploration

- **GN**, may be completed with Inter-Domain courses: 3 credits
- **GA, GH, GN, GS, Inter-Domain courses.** This may include 3 credits of World Language course work beyond the 12th credit level or the requirements for the student's degree program, whichever is higher: 6 credits

University Degree Requirements

First Year Engagement

All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3

credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

Cultures Requirement

6 credits are required and may satisfy other requirements

- United States Cultures: 3 credits
- International Cultures: 3 credits

Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits

A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition

The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (<https://senate.psu.edu/students/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/>)). For more information, check the Suggested Academic Plan for your intended program.

Integrated B.S. in Aerospace Engineering and M.I.A. in International Affairs

Undergraduate degree available at the following campuses: University Park

Graduate degree available at the following campuses: University Park

Requirements for the Integrated B.S. in Aerospace Engineering and M.I.A. in International Affairs can be found in the Graduate Bulletin (<https://bulletins.psu.edu/graduate/programs/majors/international-affairs/#integratedundergradprogramtext>).

Program Educational Objectives

Within a few years after graduation, we expect graduates of our program will be:

- Engaged in careers in the discipline of aerospace engineering, and in related disciplines where aerospace engineering knowledge and skills are beneficial, that applies the knowledge and skills for precise engineering analysis and open-ended problem solving and design.
- Pursuing continued professional development through multiple pathways including graduate programs in aerospace engineering, and in related disciplines where aerospace engineering knowledge and

skills bring a useful perspective, with the skills needed for engineering research and more advanced studies.

- Acting as professionals representing aerospace engineering concerns with effective communication and teamwork skills, awareness of current issues, and ethical decision making.

Student Outcomes

Student outcomes describe what students are expected to know and be able to do by the time of graduation. The Aerospace Engineering program is designed to enable students 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.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/students/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

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Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2025-26 academic year. To access previous years' suggested academic plans, please visit the archive (<https://>

bulletins.psu.edu/undergraduate/archive/) to view the appropriate Undergraduate Bulletin edition.

Aerospace Engineering, B.S. at University Park Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer to: <https://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year

Fall	Credits Spring	Credits
CHEM 110 (GN) ^{*#†}	3 EDSGN 100 ^{*#}	3
ECON 102 or 104 (GS) [†]	3 ENGL 15, 30H, or ESL 15 (GWS) ^{††}	3
MATH 140 or 140E (GQ) ^{*†#†}	4 MATH 141 or 141E (GQ) ^{*†#†}	4
PHYS 211 (GN, PHYSICS 211L & PHYSICS 211R) ^{*#†}	4 PHYS 212 (GN, PHYSICS 212L & PHYSICS 212R) ^{*†}	4
AERSP 1 or 97 (or First Year Seminar) [†]	1 General Education Course [†]	3
	15	17

Second Year

Fall	Credits Spring	Credits
CMPSC 201	3 CAS 100A or 100B (GWS) ^{††}	3
EMCH 210	5 EMCH 212 [*]	3
MATH 220	2 EMCH 315	2
MATH 250 [*]	3 EMCH 316	1
General Education Course [†]	3 MATH 230	4
	ME 201	3
	16	16

Third Year

Fall	Credits Spring	Credits
AERSP 301 [*]	3 AERSP 304	3
AERSP 309 [*]	3 AERSP 305W [†]	3
AERSP 311 [*]	3 AERSP 306 [*]	3
AERSP 313 [*]	3 AERSP 312	3
ENGL 202C (GWS) ^{††}	3 PHYS 214 (GN)	2
General Education Course (GHW) [†]	1.5 General Education Course [†]	3
	16.5	17

Fourth Year

Fall	Credits Spring	Credits
AERSP 401A or 402A	3 AERSP 401B or 402B	2
AERSP 410	3 AERSP 424, EE 210, or EE 212	3
AERSP 413 or 450	3 AERSP Technical Elective	3
AERSP Technical Elective	3 Limited Elective	3
General Technical Elective	3 General Education Course [†]	3

General Education Course (GHW) [†]	1.5 General Education Course [†]	3
	16.5	17

Total Credits 131

- * Course requires a grade of C or better for the major
- ‡ Course requires a grade of C or better for General Education
- # Course is an Entrance to Major requirement
- † Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

College Notes:

- **AERSP 401A/AERSP 401B and AERSP 402A/AERSP 402B:** Students may schedule either the spacecraft design sequence (AERSP 401A and AERSP 401B) or the aircraft design sequence (AERSP 402A and AERSP 402B). The appropriate control course (AERSP 413 or AERSP 450) should be scheduled accordingly.
- **AERSP Technical Elective:** Select from department list. Students who complete the Cooperative Education Program may substitute 3 co-op credits for a Technical Elective and 3 co-op credits for a Limited Elective.
- **Health and Physical Activity Elective (GHW):** Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for a Limited Elective.
- **Limited Elective:** Select from department list. Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for a Limited Elective. Students who complete the Cooperative Education Program may substitute 3 co-op credits for a Technical Elective and 3 co-op credits for a Limited Elective.
- **These courses offered at University Park in fall semester only:**
 - AERSP 301
 - AERSP 309
 - AERSP 311
 - AERSP 313
 - AERSP 401A

- AERSP 402A
- AERSP 410
- AERSP 413
- AERSP 450
- **These courses offered at University Park in spring semester only:**
 - AERSP 304
 - AERSP 306
 - AERSP 312
 - AERSP 401B
 - AERSP 402B
- **These courses offered at University Park in fall and spring semesters:**
 - AERSP 305W
 - AERSP 424

Career Paths

Aerospace engineers work primarily in the aerospace industry, at systems and software suppliers, corporate labs, government labs, and universities. Their skill set is extremely broad and multidisciplinary, and the experience of aerospace engineers as systems architects and engineers allows them to make contributions in many diverse sectors. Our graduate programs provide outstanding research opportunities across a broad spectrum of topics, and encompass both computational and experimental research approaches. Students may embrace traditional fields like aerodynamics, propulsion, flight science, vehicle dynamics, aeroacoustics, and rotorcraft engineering, as well as leading-edge research areas such as UAVs, commercial space, nanomanufacturing, and wind energy.

Careers

The industries that employed the most aerospace engineers are:

- Aerospace product and parts manufacturing.
- Engineering services.
- Federal government, excluding postal service.
- Research and development in the physical, engineering, and life sciences.
- Navigational, measuring, electromedical, and control instruments manufacturing.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES OF THE AEROSPACE ENGINEERING PROGRAM (<https://career.engr.psu.edu>)

Opportunities for Graduate Studies

The aerospace engineering department offers the following graduate degree options: " Master of Engineering (M.Eng.) " Master of Science (M.S.) " Doctor of Philosophy (Ph.D.) Students may also earn a graduate minor in computational science and/or a graduate certificate in wind energy.

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<https://www.aero.psu.edu/academics/graduate/degrees-and-requirements.aspx>)

Professional Resources

- AHS International (<https://vtol.org/>)
- American Institute of Aeronautics and Astronautics (<https://www.aiaa.org/>)
- American Astronautical Society (<https://astronautical.org>)

Accreditation

The Bachelor of Science in Aerospace Engineering at University Park is accredited by the Engineering Accreditation Commission of ABET, <https://www.abet.org>, under the commission's General Criteria and Program Criteria for Aerospace and Similarly Named Engineering Programs.

Professional Licensure/Certification

Many U.S. states and territories require professional licensure/certification to be employed. If you plan to pursue employment in a licensed profession after completing this program, please visit the Professional Licensure/Certification Disclosures by State (<https://opair.psu.edu/plc/dashboard/>) interactive map.

Contact

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