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 2018, Fall 2018, Spring 2019
In order to be eligible for entrance to this major, students must satisfy the following requirements:
- 40-59 cumulative credits (credits completed at Penn State for which a quality letter grade was earned)
- completed with a grade of C or better: CHEM 110, MATH 140, MATH 141, MATH 250 (required for major) or MATH 251, PHYS 211, and PHYS 212
- earned a minimum of 3.20 cumulative GPA

Students Who Entered Prior to Summer 2018
Students who entered the University prior to the summer 2018 semester should view the administrative enrollment controls for the semester that they entered the university (http://advising.psu.edu/entrance-major-requirements) on the Academic Advising Portal.

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

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Education</td>
<td>45</td>
</tr>
<tr>
<td>Requirements for the Major</td>
<td>113</td>
</tr>
</tbody>
</table>

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 QQ courses; 3 credits of GS courses; 9 credits of GWS courses.

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 201, MATH 220, MATH 230, and MATH 250 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.

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 (http://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.)
- Quantification (QQ): 6 credits
- Writing and Speaking (GWS): 9 credits
Knowledge Domains
- Arts (GA): 6 credits
- Health and Wellness (GHW): 3 credits
- Humanities (GH): 6 credits
- Social and Behavioral Sciences (GS): 6 credits
- Natural Sciences (GN): 9 credits

Integrative Studies (may also complete a Knowledge Domain requirement)
- Inter-Domain or Approved Linked Courses: 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). For more information, check the Suggested Academic Plan for your intended program.

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.

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- Arts (GA): 6 credits
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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 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 (http://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy)

University Park
Robert Melton
Faculty Adviser
208 Hammond Building
University Park, PA 16802
814-863-1033
adviser@engr.psu.edu

Suggested Academic Plan
Aerospace Engineering-ending 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 here:

http://advising. engr. psu. edu/degree-requirements/academic-plans-by-major. aspx

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<thead>
<tr>
<th>First Year</th>
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<tr>
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<tr>
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<td>MATH 141 or 141E (GO)*‡†</td>
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<td>PHYS 212 (GN, PHYSICS 212L &amp; PHYSICS 212R)*†</td>
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<td>General Education Course*†</td>
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<td>EMCH 212*</td>
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### Aerospace Engineering, B.S.

<table>
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<tr>
<th>Course Code</th>
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<th>Spring Credits</th>
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<td><strong>AERSP 401B or 402B</strong> 2</td>
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<td>AERSP 410</td>
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<td><strong>AERSP 440, EE 210, or EE 212</strong> 3</td>
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<td>AERSP 413 or 450</td>
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<td><strong>AERSP Technical Elective</strong> 3</td>
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<tr>
<td>AERSP Technical Elective</td>
<td>3</td>
<td><strong>Limited Elective</strong> 3</td>
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<tr>
<td>Technical Elective</td>
<td>3</td>
<td><strong>General Education Course†</strong> 3</td>
</tr>
<tr>
<td>General Education Course (GHW)†</td>
<td>1.5</td>
<td><strong>General Education Course†</strong> 3</td>
</tr>
<tr>
<td><strong>Total Credits</strong></td>
<td><strong>16.5</strong></td>
<td><strong>17</strong></td>
</tr>
</tbody>
</table>

* 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 University 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.

GWS, GQ, GHW, GN, GA, GH, and GS are abbreviations used to identify General Education program courses. General Education includes Foundations (GWS and GQ) and Knowledge Domains (GHW, GN, GA, GH, GS, and Integrative Studies). Foundations courses (GWS and GQ) require a grade of ‘C’ or better.

Integrative Studies courses are required for the General Education program. N is the suffix at the end of a course number used to designate an Inter-Domain course and Z is the suffix at the end of a course number used to designate a Linked course.

All incoming Schreyer Honors College first-year students at University Park will take ENGL/CAS 137 in the fall semester and ENGL/CAS 138 in the spring semester. These courses carry the GWS designation and replace both ENGL 30 and CAS 100. Each course is 3 credits.

### 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 (http://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 (http://www.aero.psu.edu/academics/graduate/prospective-students.aspx)

Professional Resources
• AHS International (https://vtol.org)
• American Institute of Aeronautics and Astronautics (https://www.aiaa.org)
• American Astronautical Society (http://astronautical.org)

Accreditation

MORE INFORMATION ABOUT ABET ACCREDITATION (http://www.abet.org)

Contact
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229 Hammond Building
814-865-2569
aerospace@engr.psu.edu

http://www.aero.psu.edu/