

AEROSPACE ENGINEERING, BS

for the degree of Bachelor of Science in Aerospace Engineering

The Aerospace Engineering curriculum provides a strong fundamental background in engineering, mathematics, and science, along with the ability to apply this fundamental knowledge to the analysis and design of future aircraft and spacecraft. It also prepares students for lifelong learning and the attainment of their career goals in the field of aerospace engineering and in a wide range of other areas. The concepts of system design are introduced early in the curriculum and culminate in the yearlong senior capstone design experience (AE 442, AE 443), in which students work in teams to respond to a design challenge from industry, government, or a professional engineering society. Technical and free electives allows the student to pursue an individualized program of study.

Current Program Educational Objectives

for the degree of Bachelor of Science in Aerospace Engineering

Graduation Requirements

Minimum hours required for graduation: 128 hours.

[Minimum Overall GPA: 2.0](#)

University Requirements

Minimum of 40 hours of upper-division coursework, generally at the 300- or 400-level. These hours can be drawn from all elements of the degree.

Students should consult their academic advisor for additional guidance in fulfilling this requirement.

The university and residency requirements can be found in the Student Code (<https://studentcode.illinois.edu/article3/part8/3-801/>) (§ 3-801) and in the Academic Catalog (<http://catalog.illinois.edu/general-information/degree-general-education-requirements/>).

General Education Requirements

Follows the campus General Education (Gen Ed) requirements (<https://courses.illinois.edu/gened/DEFAULT/DEFAULT/>). Some Gen Ed requirements may be met by courses required and/or electives in the program.

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Code	Title	Hours
	Composition I	4-6
	Advanced Composition	3
	fulfilled by AE 443	
	Humanities & the Arts (6 hours)	6
	Natural Sciences & Technology (6 hours)	6
	fulfilled by CHEM 102, PHYS 211, PHYS 212	

Social & Behavioral Sciences (6 hours)	6
Cultural Studies: Non-Western Cultures (1 course)	3
Cultural Studies: US Minority Cultures (1 course)	3
Cultural Studies: Western/Comparative Cultures (1 course)	3
Quantitative Reasoning (2 courses, at least one course must be Quantitative Reasoning I)	6-10

fulfilled by MATH 220 or MATH 221; and MATH 231, MATH 241, MATH 285, PHYS 211, PHYS 212; and CS 101 or CS 124

Language Requirement (Completion of the third semester or equivalent of a language other than English is required)	0-15
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Orientation and Professional Development

Code	Title	Hours
AE 100	Intro to Aerospace Engineering	2
ENG 100	Grainger Engineering Orientation Seminar (External transfer students take ENG 300.)	1
Total Hours		3

Foundational Mathematics and Science

Code	Title	Hours
CHEM 102	General Chemistry I	3
CHEM 103	General Chemistry Lab I	1
MATH 221	Calculus I (MATH 220 may be substituted. MATH 220 is appropriate for students with no background in calculus. 4 of 5 credit hours count towards degree.)	4
MATH 231	Calculus II	3
MATH 241	Calculus III	4
MATH 257	Linear Algebra with Computational Applications	3
MATH 285	Intro Differential Equations	3
PHYS 211	University Physics: Mechanics	4
PHYS 212	University Physics: Elec & Mag	4
Total Hours		29

Aerospace Engineering Technical Core

Code	Title	Hours
AE 140	Aerospace Computer-Aided Design	2
AE 202	Aerospace Flight Mechanics	3
AE 311	Incompressible Flow	3
AE 312	Compressible Flow	3
AE 321	Mechs of Aerospace Structures	3
AE 323	Applied Aerospace Structures	3
AE 352	Aerospace Dynamical Systems	3
AE 353	Aerospace Control Systems	3
AE 370	Aerospace Numerical Methods	3
AE 433	Aerospace Propulsion	3
or AE 434	Rocket Propulsion	
AE 442	Aerospace Systems Design I	3
AE 443	Aerospace Systems Design II	3
AE 460	Aerodynamics & Propulsion Lab	2
AE 461	Structures & Control Lab	2

AE 483	Autonomous Systems Lab	2
CS 101	Intro Computing: Engrg & Sci (CS 124 may be taken instead of CS 101.)	3
ECE 205	Electrical and Electronic Circuits	3
ME 200	Thermodynamics	3
MSE 280	Engineering Materials	3
TAM 210	Introduction to Statics	2
TAM 212	Introductory Dynamics	3
Total Hours		58

Technical Electives

Code	Title	Hours
Select from the departmentally approved list of Technical Electives. Student will choose 6 hours of AE Technical Electives and 6 hours of either additional AE Technical Electives or Non-AE Technical Electives.		12

AE Technical Electives listed below

AE 402	Orbital Mechanics	3 or 4
AE 403	Spacecraft Attitude Control	3 or 4
AE 410	Computational Aerodynamics	3 or 4
AE 412	Viscous Flow & Heat Transfer	4
AE 416	Applied Aerodynamics	3 or 4
AE 419	Aircraft Flight Mechanics	3 or 4
AE 420	Finite Element Analysis	3 or 4
AE 428	Mechanics of Composites	3
AE 435	Electric Space Propulsion	3 or 4
AE 451	Aeroelasticity	3 or 4
AE 454	Systems Dynamics & Control	3 or 4
AE 456	Global Nav Satellite Systems	4
AE 468	Optical Remote Sensing	3
AE 482	Introduction to Robotics	4
AE 484	UAV Performance, Design, and Fabrication	3
AE 485	Spacecraft Environment and Interactions	3 or 4
AE 497	Independent Study	1 to 4
AE 498	Special Topics	1 to 4
ENG 491	Interdisciplinary Design Proj (CU1 & CU2)	1 to 4

Non-AE Technical Electives below

ASTR 404	Stellar Astrophysics	3
ASTR 405	Planetary Systems	3
ASTR 406	Galaxies and the Universe	3
ASTR 414	Astronomical Techniques	4
ATMS 301	Atmospheric Thermodynamics	3
ATMS 302	Atmospheric Dynamics I	3
ATMS 303	Synoptic-Dynamic Wea Analysis	4
ATMS 304	Radiative Transfer-Remote Sens	3
ATMS 305	Computing and Data Analysis	3
ATMS 306	Cloud Physics	3
ATMS 313	Synoptic Weather Forecasting	4
ATMS 406	Tropical Meteorology	4
ATMS 410	Radar Remote Sensing	4
CEE 310	Transportation Engineering	3
CEE 330	Environmental Engineering	3

CEE 360	Structural Engineering	3
CEE 380	Geotechnical Engineering	3
CEE 407	Airport Design	3 or 4
CEE 412	High-Speed Rail Engineering	3 or 4
CEE 451	Environmental Fluid Mechanics	3
CEE 471	Structural Mechanics	3 or 4
CHEM 232	Elementary Organic Chemistry I	3 or 4
CHEM 233	Elementary Organic Chem Lab I	2
CHEM 236	Fundamental Organic Chem I	4
CS 225	Data Structures	4
CS 420	Parallel Progrmg: Sci & Engrg	3 or 4
CS 461	Computer Security I	4
CS 465	User Interface Design	4
CSE 412	Numerical Thermo-Fluid Mechs	2 to 4
ECE 210	Analog Signal Processing	4
ECE 220	Computer Systems & Programming	4
ECE 310	Digital Signal Processing	3
ECE 311	Digital Signal Processing Lab	1
ECE 329	Fields and Waves I	3
ECE 330	Power Ckts & Electromechanics	3
ECE 342	Electronic Circuits	3
ECE 343	Electronic Circuits Laboratory	1
ECE 385	Digital Systems Laboratory	3
ECE 473	Fund of Engrg Acoustics	3 or 4
ECE 486	Control Systems	4
ENG 491	Interdisciplinary Design Proj (Sections SAE and HYP)	1 to 4
ES 470	Fuel Cells & Hydrogen Sources	3
ES 475	Wind Power Systems	3 or 4
MSE 401	Thermodynamics of Materials	3
MSE 440	Mechanical Behavior of Metals	3
MSE 443	Design of Engineering Alloys	3
MSE 498	Special Topics (Section CM3)	1 to 4
SE 310	Design of Structures and Mechanisms	3
SE 420	Digital Control Systems	4
SE 423	Mechatronics	3
IE 310	Deterministic Models in Optimization	3
MATH 347	Fundamental Mathematics	3
MATH 402	Non Euclidean Geometry	3 or 4
MATH 413	Intro to Combinatorics	3 or 4
MATH 416	Abstract Linear Algebra	3 or 4
MATH 442	Intro Partial Diff Equations	3 or 4
MATH 446	Applied Complex Variables	3 or 4
MATH 461	Probability Theory	3 or 4
MATH 482	Linear Programming	3 or 4
MATH 484	Nonlinear Programming	3 or 4
MATH 489	Dynamics & Differential Eqns	3 or 4
ME 320	Heat Transfer	4
ME 360	Signal Processing	3.5
ME 370	Mechanical Design I	3
ME 400	Energy Conversion Systems	3 or 4
ME 401	Refrigeration and Cryogenics	3 or 4

ME 498	Special Topics	1 to 4
MSE 450	Polymer Science & Engineering	3 or 4
MSE 453	Plastics Engineering	3
MSE 457	Polymer Chemistry	3 or 4
NPRE 201	Energy Systems	2 or 3
NPRE 402	Nuclear Power Engineering	3 or 4
NPRE 498	Special Topics (Energy Storage and Conveyance)	1 to 4
PHYS 325	Classical Mechanics I	3
PHYS 326	Classical Mechanics II	3
PHYS 435	Electromagnetic Fields I	3
PHYS 485	Atomic Phys & Quantum Theory	3
PHYS 486	Quantum Physics I	4
STAT 428	Statistical Computing	3 or 4
STAT 448	Advanced Data Analysis	4
TAM 324	Behavior of Materials	4
TAM 451	Intermediate Solid Mechanics	4
TAM 456	Experimental Stress Analysis	3
TAM 470	Computational Mechanics	3 or 4
TE 401	Developing Breakthrough Projects	1 to 4
TMGT 461	Tech, Eng, & Mgt Final Project	4

Free Electives

Code	Title	Hours
Additional course work, subject to the Grainger College of Engineering restrictions to Free Electives, so that there are at least 128 credit hours earned toward the degree. (https://go.grainger.illinois.edu/FreeElectives/)		10
Total Hours of Curriculum to Graduate		128

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Sample Sequence

This sample sequence is intended to be used only as a guide for degree completion. All students should work individually with their academic advisors to decide the actual course selection and sequence that works best for them based on their academic preparation and goals. Enrichment programming such as study abroad, minors, internships, and so on may impact the structure of this four-year plan. Course availability is not guaranteed during the semester indicated in the sample sequence. The curriculum sequence can also be viewed via dynamic and static curricular maps (<https://grainger.illinois.edu/academics/undergraduate/majors-and-minors/aerospace-map/>), which include prerequisite sequencing.

Students must fulfill their Language Other Than English requirement by successfully completing a third level of a language other than English. See the corresponding section on the Degree and General Education Requirements (<http://catalog.illinois.edu/general-information/degree-general-education-requirements/>).

Free Electives: Additional course work, subject to the Grainger College of Engineering restrictions to Free Electives (<https://go.grainger.illinois.edu/FreeElectives/>), so that there are at least 128 credit hours earned toward the degree.

First Year		
First Semester		Hours
AE 100		2
ENG 100		1
MATH 221 (MATH 220 may be substituted)		4
CHEM 102		3
CHEM 103		1
AE 140		2
Composition I or General Education course (Choose a Humanities or Social/Behavioral Science)		4
		17

Total Hours 17

First Year		
Second Semester		Hours
MATH 231		3
MATH 257		3
PHYS 211		4
CS 101		3
General Education course (Choose a Humanities or Social/Behavioral Science) or Composition I		3
		16

Total Hours 16

Second Year		
First Semester		Hours
MATH 241		4
PHYS 212		4
TAM 210		2
MSE 280		3
General Education course (Choose a Humanities or Social/Behavioral Science course with Cultural Studies designation)		3
		16

Total Hours 16

Second Year		
Second Semester		Hours
MATH 285		3
ME 200		3
AE 202		3
TAM 212		3
General Education course (Choose a Humanities or Social/Behavioral Science course with Cultural Studies designation)		3
Free Elective course		3
		18

Total Hours 18

Third Year

First Semester	Hours
AE 311	3
AE 321	3
AE 352	3
ECE 205	3
General Education course (Choose a Humanities or Social/Behavioral Science course with Cultural Studies designation)	3
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	15

Total Hours 15**Third Year**

Second Semester	Hours
AE 312	3
AE 323	3
AE 353	3
AE 370	3
Language Other Than English (3rd level course)	4
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	16

Total Hours 16**Fourth Year**

First Semester	Hours
AE 442	3
AE 433	3
AE 460	2
AE 483	2
Technical Elective course	3
Free Elective course	3
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	16

Total Hours 16**Fourth Year**

Second Semester	Hours
AE 443	3
AE 461	2
Technical Elective course	3
Technical Elective course	3
Technical Elective course	3
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	14

Total Hours 14**Total Hours: 128**

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Student learning outcomes are based on learning outcomes in line with the ABET accreditation process.

Aerospace Engineering graduates will have:

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.

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Aerospace Engineering (<https://aerospace.illinois.edu>)

Aerospace Engineering faculty (<https://aerospace.illinois.edu/directory/faculty/>)

The Grainger College of Engineering (<https://grainger.illinois.edu/>)

The Grainger College of Engineering Admissions (<https://grainger.illinois.edu/admissions/>)