

# AEROSPACE ENGINEERING (BS)

## Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (<https://catalog.calpoly.edu/academic-standards-policies/general-requirements-bachelors-degree/>) section of this catalog, including:

- 40 units of upper-division courses
- 2.0 GPA
- Graduation Writing Requirement (GWR)
- U.S. Cultural Pluralism (USCP)

Note: No Major, Support or Concentration courses may be selected as credit/no credit. In addition, no more than 12 units of cooperative or internship courses can count towards your degree requirements.

Code	Title	Units
<b>MAJOR COURSES</b>		
AERO 1121	Aerospace Fundamentals	2
AERO 2220	Aerospace Engineering Dynamics	3
AERO 3300	Engineering Numerical Analysis (Upper-Division 2/5) <sup>1</sup>	4
AERO 3301	Thermo Fluid Dynamics	4
AERO 3302	Thermo Fluids Laboratory	1
AERO 3303	Heat and Mass Transfer	2
AERO 3304	Aerospace Propulsion Systems	3
AERO 3320	System Dynamics	3
AERO 3331	Aerospace Structural Analysis I	4
AERO 3460	Aerospace Engineering Professional Preparation	1
AERO 4403	Propulsion Laboratory	1
AERO 4431	Aerospace Structural Analysis II	3
AERO 4433	Experimental Stress Analysis	1
<b>Concentration</b>		
(See list of Concentrations below)		27
<b>SUPPORT COURSES</b>		
CHEM 1120	Fundamentals of Chemical Structure and Properties (5A & 5C) <sup>1</sup>	4
ENGR 2211	Introduction to Mechanics	4
IME 1143 & IME 1140	Introduction to Design and Manufacturing and Technical Graphics Communication for Design and Manufacturing	3
MATE 1220	Principles of Materials Engineering for Non-Majors	2
MATH 1261	Calculus I (2) <sup>1</sup>	4
MATH 1262	Calculus II	4
MATH 2263	Calculus III	3
MATH 2341	Linear Analysis	4
PHYS 1141	General Physics I	4
PHYS 1143	General Physics II	4
<b>GENERAL EDUCATION (GE)</b>		
(See GE program requirements below)		33
<b>FREE ELECTIVES</b>		
Free Electives		0
<b>Total Units</b>		<b>128</b>

<sup>1</sup> Required in Major or Support; also satisfies General Education (GE) requirement.

## Concentrations

### Aeronautics

Code	Title	Units
<b>REQUIRED COURSES</b>		
AERO 3305	Introduction to Aerodynamics	3
AERO 4401	Ground to Space Propulsion	2
AERO 4405	Advanced Aerodynamics	3
AERO 4406	Experimental Aerodynamics	1
AERO 4420	Aircraft Dynamics and Control	3
AERO 4461 & AERO 4462	Aircraft Design Senior Project I and Aircraft Design Senior Project II	6
<b>Technical Electives</b>		
Select from the following:		9
AERO 3351	Introduction to Orbital Mechanics	
AERO 4402	Spaceflight Propulsion	
AERO 4407	Applied Computational Aerodynamics	
AERO 4408	Re-Entry Aerodynamics	
AERO 4409	Aerospace Flight Test	
AERO 4421	Spacecraft Attitude Dynamics and Control	
AERO 4422	Flight Dynamics and Automatic Control	
AERO 4425	Aircraft Performance	
AERO 4446	Spacecraft Electrical and Electric Systems	
AERO 4450	Introduction to Aerospace Systems Engineering	
AERO 4452	Intermediate Orbital Mechanics	
AERO 4455 & AERO 4456	Space Environments and Space Environments Laboratory	
AERO 4457	Introduction to Human Spaceflight	
AERO 4470	Special Advanced Topics	
AERO 4471	Special Advanced Laboratory	
AERO 5504	Finite Element Analysis of Continua	
AERO 5507	Computational Aerodynamics	
AERO 5526	Spacecraft Thermal/Fluid Control	
AERO 5534	Aerospace Structural Dynamics Analysis	
AERO 5540	Advanced Ground to Space Transportation	
AERO 5541	Hypersonic Airbreathing Propulsion	
AERO 5548	Complexity in Engineered Systems	
AERO 5549	Systems Engineering Applications	
AERO 5553	Advanced Control Theory	
AERO 5557	Advanced Orbital Mechanics	
AERO 5560	Advanced Spacecraft Dynamics and Control	
AERO 5568	Aerospace Research and Development I	
AERO 5569	Aerospace Research and Development II	
AERO 5570	Special Advanced Topics	
AERO 5571	Special Advanced Laboratory	
<b>Total Units</b>		<b>27</b>

### Astronautics

Code	Title	Units
<b>REQUIRED COURSES</b>		
AERO 3351	Introduction to Orbital Mechanics	3
AERO 4402	Spaceflight Propulsion	2
AERO 4421	Spacecraft Attitude Dynamics and Control	3

AERO 4446	Spacecraft Electrical and Electric Systems	3
AERO 4455 & AERO 4456	Space Environments and Space Environments Laboratory	4
AERO 4463 & AERO 4464	Spacecraft Design Senior Project I and Spacecraft Design Senior Project II	6

**Technical Electives**

Select from the following: 6

AERO 3305	Introduction to Aerodynamics	
AERO 4401	Ground to Space Propulsion	
AERO 4405	Advanced Aerodynamics	
AERO 4406	Experimental Aerodynamics	
AERO 4407	Applied Computational Aerodynamics	
AERO 4408	Re-Entry Aerodynamics	
AERO 4409	Aerospace Flight Test	
AERO 4420	Aircraft Dynamics and Control	
AERO 4422	Flight Dynamics and Automatic Control	
AERO 4425	Aircraft Performance	
AERO 4450	Introduction to Aerospace Systems Engineering	
AERO 4452	Intermediate Orbital Mechanics	
AERO 4457	Introduction to Human Spaceflight	
AERO 4470	Special Advanced Topics	
AERO 4471	Special Advanced Laboratory	
AERO 5504	Finite Element Analysis of Continua	
AERO 5507	Computational Aerodynamics	
AERO 5522	Boundary-Layer Theory	
AERO 5526	Spacecraft Thermal/Fluid Control	
AERO 5534	Aerospace Structural Dynamics Analysis	
AERO 5540	Advanced Ground to Space Transportation	
AERO 5541	Hypersonic Airbreathing Propulsion	
AERO 5548	Complexity in Engineered Systems	
AERO 5549	Systems Engineering Applications	
AERO 5553	Advanced Control Theory	
AERO 5557	Advanced Orbital Mechanics	
AERO 5560	Advanced Spacecraft Dynamics and Control	
AERO 5568	Aerospace Research and Development I	
AERO 5569	Aerospace Research and Development II	
AERO 5570	Special Advanced Topics	
AERO 5571	Special Advanced Laboratory	

**Total Units** **27**

**General Education (GE) Requirements**

**General Education (GE) Requirements**

- 43 units required, 10 of which are specified in Major and/or Support.
- If any of the remaining 33 Units is used to satisfy a Major or Support requirement, additional units of Free Electives may be needed to complete the total units required for the degree.
- See the complete GE course listing (<https://catalog.calpoly.edu/academic-standards-policies/general-requirements-bachelors-degree/#generaleducationtext>).
- A grade of C- or better is required in one course in each of the following GE Areas: 1A (English Composition), 1B (Critical Thinking), 1C (Oral Communication), and 2 (Mathematics and Quantitative Reasoning).

**Lower-Division General Education**

<b>Area 1</b>	<b>English Communication and Critical Thinking</b>	
1A	Written Communication	3

1B	Critical Thinking	3
1C	Oral Communication	3
<b>Area 2</b>	<b>Mathematics and Quantitative Reasoning</b>	
2	Mathematics and Quantitative Reasoning (3 units in Support) <sup>1</sup>	0
<b>Area 3</b>	<b>Arts and Humanities</b>	
3A	Arts	3
3B	Humanities: Literature, Philosophy, Languages other than English	3
<b>Area 4</b>	<b>Social and Behavioral Sciences (Area 4 courses must come from at least two different course prefixes.)</b>	
4A	American Institutions (Title 5, Section 40404 Requirement)	3
4B	Social and Behavioral Sciences	3
<b>Area 5</b>	<b>Physical and Life Sciences</b>	
5A	Physical Sciences (3 units in Support) <sup>1</sup>	0
5B	Life Sciences	3
5C	Laboratory (may be embedded in a 5A or 5B course) (1 units in Support) <sup>1</sup>	0
<b>Area 6</b>	<b>Ethnic Studies</b>	
6	Ethnic Studies	3
<b>Upper-Division General Education</b>		
Upper-Division 2/5	Mathematics and Quantitative Reasoning or Physical and Life Sciences (3 units in Major) <sup>1</sup>	0
Upper-Division 3	Arts and Humanities	3
Upper-Division 4	Social and Behavioral Sciences (Area 4 courses must come from at least two different course prefixes.)	3
<b>Total Units</b>		<b>33</b>

<sup>1</sup> Required in Major or Support; also satisfies General Education (GE) requirement.