

# Aerospace Engineering (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (<https://apps.oirp.ncsu.edu/pgas/>)!

## Plan Requirements

### First Year

Fall Semester		Hours
CH 101	Chemistry - A Molecular Science <sup>1</sup>	3
CH 102	General Chemistry Laboratory <sup>1</sup>	1
E 101	Introduction to Engineering & Problem Solving <sup>2</sup>	1
E 115	Introduction to Computing Environments	1
MA 141	Calculus I <sup>1</sup>	4
ENG 101	Academic Writing and Research <sup>2</sup>	4
Select one of the following Economics Courses:		3
ARE 201	Introduction to Agricultural & Resource Economics	
ARE 201A	Introduction to Agricultural & Resource Economics	
EC 201	Principles of Microeconomics	
EC 205	Fundamentals of Economics	
<b>Hours</b>		<b>17</b>

### Spring Semester

CSC 113	Introduction to Computing - MATLAB	3
GC 120	Foundations of Graphics	3
MA 241	Calculus II <sup>1</sup>	4
PY 205 & PY 206	Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory <sup>1</sup>	4
E 102	Engineering in the 21st Century	2
<b>Hours</b>		<b>16</b>

### Second Year

Fall Semester		Hours
MA 242	Calculus III	4
MAE 206	Engineering Statics <sup>2</sup>	3
MAE 250	Introduction to Aerospace Engineering	1
MAE 251	Aerospace Vehicle Performance <sup>2</sup>	3
PY 208 & PY 209	Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory	4
<b>Hours</b>		<b>15</b>
Spring Semester		Hours
MA 341	Applied Differential Equations I	3
MAE 208	Engineering Dynamics <sup>2</sup>	3
MAE 214	Solid Mechanics <sup>2</sup>	3
MAE 252	Aerodynamics I	3
MAE 253	Experimental Aerodynamics I	1
<b>Hours</b>		<b>13</b>

### Third Year

Fall Semester		Hours
MAE 201	Engineering Thermodynamics I <sup>2</sup>	3
MAE 361	Dynamics & Controls	3
MAE 371	Aerospace Structures I	3
MAE 372	Aerospace Vehicle Structures Lab	1
ENG 331	Communication for Engineering and Technology	3
<b>Hours</b>		<b>13</b>

### Spring Semester

MAE 351	Aerodynamics II	3
MAE 352	Experimental Aerodynamics II	1
MAE 457 or MAE 467	Flight Vehicle Stability and Control or Introduction to Space Flight	3
AE Guided Technical Elective I (p. 2)		3
Math Elective (p. 2)		3
<b>Hours</b>		<b>13</b>

### Fourth Year

Fall Semester		Hours
MAE 405	Controls Lab	1
MAE 435	Principles of Automatic Control	3
MAE 451	Experimental Aerodynamics III	1
MAE 480	Aerospace Vehicle Design I	3
AE Guided Technical Elective II (p. 2)		3
Technical Elective (p. 2)		3
<b>Hours</b>		<b>14</b>

### Spring Semester

MAE 481	Aerospace Vehicle Design II	3
Ethics Elective (verify requirement) (p. 4)		
MAE 457 or MAE 467	Flight Vehicle Stability and Control or Introduction to Space Flight	3
Technical Elective (p. 2)		3
<b>Hours</b>		<b>9</b>
<b>Total Hours</b>		<b>110</b>

<sup>1</sup> A grade of C or higher is required.

<sup>2</sup> A grade of C- or higher is required.

Code	Title	Hours	Counts towards
<b>GEP Courses</b>			
	GEP Humanities ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/</a> )	6	
	GEP Social Sciences ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/</a> )	3	
	GEP Health and Exercise Studies ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/</a> )	2	

GEP US Diversity, Equity, and Inclusion ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-usdei/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-usdei/</a> )	3
GEP Interdisciplinary Perspectives ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/</a> )	3
GEP Global Knowledge ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-global-knowledge/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-global-knowledge/</a> ) (verify requirement)	
Foreign Language Proficiency ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/foreign-language-proficiency/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/foreign-language-proficiency/</a> ) (verify requirement)	
<b>Total Hours</b>	<b>17</b>

## AE Guided Technical Electives I

Code	Title	Hours	Counts towards
<b>Structures Elective</b>			
MAE 430	Applied Finite Element Analysis	3	
MAE 472	Aerospace Structures II	3	
<b>Propulsion Elective</b>			
MAE 458	Propulsion	3	
MAE 459	Rocket Propulsion	3	

## Math Electives

Code	Title	Hours	Counts towards
MA 305	Introductory Linear Algebra and Matrices	3	
MA 405	Introduction to Linear Algebra	3	
ST 305		4	
ST 312	Introduction to Statistics II	3	
ST 370	Probability and Statistics for Engineers	3	
ST 371	Introduction to Probability and Distribution Theory	3	
ST 372	Introduction to Statistical Inference and Regression	3	

## AE Guided Technical Electives II

Code	Title	Hours	Counts towards
<b>Flight Space Elective</b> Both space/flight electives are required to satisfy degree requirements			
		<b>6</b>	
MAE 457	Flight Vehicle Stability and Control	3	
MAE 467	Introduction to Space Flight	3	
<b>Structures Elective</b>			
MAE 430	Applied Finite Element Analysis	3	
MAE 472	Aerospace Structures II	3	
<b>Propulsion Elective</b>			
MAE 458	Propulsion	3	
MAE 459	Rocket Propulsion	3	

## Technical Electives

Code	Title	Hours	Counts towards
<b>Aerodynamics &amp; Propulsion</b>			
MAE 452	Aerodynamics of V/STOL Vehicles	3	
MAE 455	Boundary Layer Theory	3	
MAE 456	Computational Methods in Aerodynamics	3	
MAE 458	Propulsion	3	
MAE 459	Rocket Propulsion	3	
<b>Structures &amp; Manufacturing</b>			
MAE 430	Applied Finite Element Analysis	3	
MAE 472	Aerospace Structures II	3	
<b>MSE 201/ECE 331</b>			
ECE 331	Principles of Electrical Engineering	3	
MSE 201	Structure and Properties of Engineering Materials	3	
<b>Additional Technical Electives</b>			
ECE 482	Engineering Entrepreneurship and New Product Development I	3	
ECE 483	Engineering Entrepreneurship and New Product Development II	3	
MAE 403	Air Conditioning	3	

MAE 406	Energy Conservation in Industry	3	MAE 515	Advanced Automotive Vehicle Dynamics	3
MAE 407	Steam and Gas Turbines	3	MAE 517	Advanced Precision Manufacturing for Products, Systems and Processes	3
MAE 408	Internal Combustion Engine Fundamentals	3	MAE 518	Acoustic Radiation I	3
MAE 410	Modern Manufacturing Processes	3	MAE 520	Dynamic Analysis of Human Movement	3
MAE 421	Design of Solar Energy Systems	3	MAE 521	Linear Control and Design For Mimo Systems	3
MAE 430	Applied Finite Element Analysis	3	MAE 522	Non Linear System Analysis and Control	3
MAE 482	Engineering Entrepreneurship and New Product Development I	3	MAE 525	Advanced Flight Vehicle Stability and Control	3
MAE 483	Engineering Entrepreneurship and New Product Development II	3	MAE 526	Fundamentals of Product Design	3
MAE 495	Special Topics in Mechanical and Aerospace Engineering	1-3	MAE 528	Experimental Flight Testing	3
MAE 496	Undergraduate Project Work in Mechanical and Aerospace Engineering	1-6	MAE 531	Engineering Design Optimization	3
<b>MAE 500 Level Courses</b>			MAE 532	Smart Structures and Micro-Transducers	3
ECE 535	Design of Electromechanical Systems	3	MAE 533	Finite Element Analysis I	3
FB 534			MAE 534	Mechatronics Design	3
MAE 420	Dynamic Analysis of Human Movement	3	MAE 535	Design of Electromechanical Systems	3
MAE 426	Fundamentals of Product Design	3	MAE 536	Micro/Nano Electromechanical Systems	3
MAE 501	Advanced Engineering Thermodynamics	3	MAE 537	Mechanics Of Composite Structures	3
MAE 504	Fluid Dynamics Of Combustion I	3	MAE 538	Smart Structures and Materials	3
MAE 505	Heat Transfer Theory and Applications	3	MAE 539	Advanced Materials	3
MAE 511	Advanced Dynamics I	3	MAE 540	Advanced Air Conditioning Design	3
MAE 513	Principles of Structural Vibration	3	MAE 541	Advanced Solid Mechanics I	3
			MAE 543	Fracture Mechanics	3

MAE 544	Robot Mechanics and Control	3
MAE 545	Metrology For Precision Manufacturing	3
MAE 546	Photonic Sensor Applications in Structure	3
MAE 550	Foundations Of Fluid Dynamics	3
MAE 551	Airfoil Theory	3
MAE 552	Introduction to Experimental Fluid Dynamics and Measurement Systems	3
MAE 553	Compressible Fluid Flow	3
MAE 554	Hypersonic Aerodynamics	3
MAE 555	Applications of Acoustic and Elastic Wave Propagation	3
MAE 558	Microfluidics and Nanofluidics	3
MAE 560	Computational Fluid Mechanics and Heat Transfer	3
MAE 561	Wing Theory	3
MAE 562	Physical Gas Dynamics	3
MAE 573	Hydrodynamic Stability and Transition	3
MAE 575	Advanced Propulsion Systems	3
MAE 577	Multiscale Two-phase Flow Simulations	3
MAE 586	Project Work In Mechanical and Aerospace Engineering	1-6
MAE 589	Special Topics In Mechanical and Aerospace Engineering	1-6
MSE 539	Advanced Materials	3
NE 577	Multiscale Two-phase Flow Simulations	3

## Ethics Electives

Code	Title	Hours	Counts towards
IDS 201	Environmental Ethics	3	
PHI 214	Issues in Business Ethics	3	
PHI 325	Bio-Medical Ethics	3	
PHI 375	Ethics	3	
STS 302	Contemporary Science, Technology and Human Values	3	
STS 304	Ethical Dimensions of Progress	3	
STS 325	Bio-Medical Ethics	3	

## Semester Sequence

This is a sample.

### First Year

Fall Semester	Hours	
CH 101	Chemistry - A Molecular Science <sup>1</sup>	3
CH 102	General Chemistry Laboratory <sup>1</sup>	1
E 101	Introduction to Engineering & Problem Solving <sup>1,2</sup>	1
E 115	Introduction to Computing Environments <sup>1,2</sup>	1
ENG 101	Academic Writing and Research <sup>1,2</sup>	4
MA 141	Calculus I <sup>1</sup>	4
Select one of the following:		3
EC 205	Fundamentals of Economics	
EC 201	Principles of Microeconomics	
ARE 201	Introduction to Agricultural & Resource Economics	
GEP Health and Exercise Studies ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/</a> )		1

**Hours 18**

### Spring Semester

CSC 113	Introduction to Computing - MATLAB	3
GC 120	Foundations of Graphics	3
MA 241	Calculus II <sup>1</sup>	4
PY 205 & PY 206	Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory <sup>1</sup>	4
GEP Health and Exercise Studies ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/</a> )		1
E 102	Engineering in the 21st Century	2

**Hours 17**

### Second Year

#### Fall Semester

MA 242	Calculus III	4
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MAE 206	Engineering Statics <sup>2,3</sup>	3
MAE 250	Introduction to Aerospace Engineering	1
MAE 251	Aerospace Vehicle Performance <sup>2</sup>	3
PY 208 & PY 209	Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory	4
<b>Hours</b>		<b>15</b>

**Spring Semester**

MA 341	Applied Differential Equations I	3
MAE 208	Engineering Dynamics <sup>2,3</sup>	3
MAE 214	Solid Mechanics <sup>2,3</sup>	3
MAE 252	Aerodynamics I <sup>2</sup>	3
MAE 253	Experimental Aerodynamics I	1
GEP Requirement ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/</a> )		3
<b>Hours</b>		<b>16</b>

**Third Year****Fall Semester**

MAE 201	Engineering Thermodynamics I <sup>2</sup>	3
MAE 361	Dynamics & Controls	3
MAE 371	Aerospace Structures I	3
MAE 372	Aerospace Vehicle Structures Lab	1
ENG 331	Communication for Engineering and Technology	3
Ethics ( (p. 4)GEP Requirement ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/</a> ))		3
<b>Hours</b>		<b>16</b>

**Spring Semester**

MAE 351	Aerodynamics II	3
MAE 352	Experimental Aerodynamics II	1
Math Elective (p. 2)		3
GEP Requirement ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/</a> )		3
Flight/Space Elective (p. 2)		3
Structures Elective (p. 2)		3
<b>Hours</b>		<b>16</b>

**Fourth Year****Fall Semester**

MAE 405	Controls Lab	1
MAE 435	Principles of Automatic Control	3
MAE 451	Experimental Aerodynamics III	1
MAE 480	Aerospace Vehicle Design I	3
Propulsion Elective (p. 2)		3
Technical Elective (p. 2)		3
<b>Hours</b>		<b>14</b>

**Spring Semester**

MAE 481	Aerospace Vehicle Design II	3
GEP Requirement ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/</a> )		3
GEP Requirement ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/</a> )		3
Flight/Space Elective (p. 2)		3

Technical Elective (p. 2)	3
<b>Hours</b>	<b>15</b>
<b>Total Hours</b>	<b>127</b>

<sup>1</sup> A grade of C or higher is required.

<sup>2</sup> A grade of C- or higher is required.

<sup>3</sup> A 2.5 GPA is required to enroll