

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

Aerospace Engineering (BS): 127 Total Units

| Course | Title | Hours |
|------------------------------|---|-------|
| First Year | | |
| Fall Semester | | |
| CH 101 | Chemistry - A Molecular Science ¹ | 3 |
| CH 102 | General Chemistry Laboratory ¹ | 1 |
| E 101 | Introduction to Engineering & Problem Solving ² | 1 |
| E 115 | Introduction to Computing Environments | 1 |
| MA 141 | Calculus I ¹ | 4 |
| ENG 101 | Academic Writing and Research ² | 4 |
| Select one of the following: | | 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 | |
| Hours | | 17 |
| Spring Semester | | |
| CSC 113 | Introduction to Computing - MATLAB | 3 |
| GC 120 | Foundations of Graphics | 3 |
| MA 241 | Calculus II ¹ | 4 |
| PY 205 & PY 206 | Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory ¹ | 4 |
| E 102 | Engineering in the 21st Century | 2 |
| Hours | | 16 |
| Second Year | | |
| Fall Semester | | |
| MA 242 | Calculus III | 4 |
| MAE 206 | Engineering Statics | 3 |
| MAE 250 | Introduction to Aerospace Engineering | 1 |
| MAE 251 | Aerospace Vehicle Performance ² | 3 |
| PY 208 & PY 209 | Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory | 4 |
| Hours | | 15 |
| Spring Semester | | |
| MA 341 | Applied Differential Equations I | 3 |
| MAE 208 | Engineering Dynamics ² | 3 |
| MAE 214 | Solid Mechanics ² | 3 |
| MAE 252 | Aerodynamics I | 3 |

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| MAE 253 | Experimental Aerodynamics I | 1 |
| Hours | | 13 |

Third Year

Fall Semester

| | | |
|---------|--|----|
| MAE 201 | Engineering Thermodynamics I ² | 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 |
| Hours | | 13 |

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 |
| Hours | | 13 |

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 |
| AE Guided Technical Elective II (p. 2) | | 3 |
| Technical Elective | | 3 |
| Hours | | 14 |

Spring Semester

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

¹ A grade of C or higher is required.

² A grade of C- or higher is required.

| Code | Title | Hours |
|---|-------|-------|
| GEP Courses | | |
| GEP Humanities (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/) | | 6 |
| GEP Social Sciences (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/) | | 3 |
| GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/) | | 2 |
| GEP Additional Breadth (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/) (Humanities/Social Sciences/Visual and Performing Arts) | | 3 |

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| GEP Interdisciplinary Perspectives (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/) | 3 |
| GEP U.S. Diversity (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-us-diversity/) (verify requirement) | |
| GEP Global Knowledge (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-global-knowledge/) (verify requirement) | |
| Foreign Language Proficiency (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/foreign-language-proficiency/) (verify requirement) | |
| Total Hours | 17 |

AE Guided Technical Electives I

| Code | Title | Hours |
|----------------------------|---------------------------------|-------|
| Structures Elective | | |
| MAE 430 | Applied Finite Element Analysis | 3 |
| MAE 472 | Aerospace Structures II | 3 |
| Propulsion Elective | | |
| MAE 458 | Propulsion | 3 |
| MAE 459 | Rocket Propulsion | 3 |

Math Electives

| Code | Title | Hours |
|--------|--|-------|
| MA 305 | Introductory Linear Algebra and Matrices | 3 |
| MA 405 | Introduction to Linear Algebra | 3 |
| ST 305 | Statistical Methods | 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 |
|------------------------------|--------------------------------------|-------|
| Flight Space Elective | | |
| MAE 457 | Flight Vehicle Stability and Control | 3 |
| MAE 467 | Introduction to Space Flight | 3 |
| Structures Elective | | |
| MAE 430 | Applied Finite Element Analysis | 3 |
| MAE 472 | Aerospace Structures II | 3 |
| Propulsion Elective | | |
| MAE 458 | Propulsion | 3 |
| MAE 459 | Rocket Propulsion | 3 |

Technical Electives

| Code | Title | Hours |
|---------------------------------------|---------------------------------------|-------|
| Aerodynamics & Propulsion | | |
| 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 |
| Structures & Manufacturing | | |

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|---------------------------------------|--|-----|
| MAE 430 | Applied Finite Element Analysis | 3 |
| MAE 472 | Aerospace Structures II | 3 |
| MSE 201/ECE 331 | | |
| ECE 331 | Principles of Electrical Engineering | 3 |
| MSE 201 | Structure and Properties of Engineering Materials | 3 |
| Additional Technical Electives | | |
| 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 407 | Steam and Gas Turbines | 3 |
| MAE 408 | Internal Combustion Engine Fundamentals | 3 |
| MAE 410 | Modern Manufacturing Processes | 3 |
| MAE 421 | Design of Solar Thermal Systems | 3 |
| MAE 430 | Applied Finite Element Analysis | 3 |
| MAE 482 | Engineering Entrepreneurship and New Product Development I | 3 |
| MAE 483 | Engineering Entrepreneurship and New Product Development II | 3 |
| MAE 495 | Special Topics in Mechanical and Aerospace Engineering | 1-3 |
| MAE 496 | Undergraduate Project Work in Mechanical and Aerospace Engineering | 1-6 |
| MAE 500 Level Courses | | |
| ECE 535 | Design of Electromechanical Systems | 3 |
| FB 534 | Mechatronics Design | 3 |
| MAE 420 | Dynamic Analysis of Human Movement | 3 |
| MAE 426 | Fundamentals of Product Design | 3 |
| MAE 501 | Advanced Engineering Thermodynamics | 3 |
| MAE 504 | Fluid Dynamics Of Combustion I | 3 |
| MAE 505 | Heat Transfer Theory and Applications | 3 |
| MAE 511 | Advanced Dynamics with Applications to Aerospace Systems | 3 |
| MAE 513 | Principles of Structural Vibration | 3 |
| MAE 515 | Advanced Automotive Vehicle Dynamics | 3 |
| MAE 517 | Advanced Precision Manufacturing for Products, Systems and Processes | 3 |
| MAE 518 | Acoustic Radiation I | 3 |
| MAE 520 | Dynamic Analysis of Human Movement | 3 |
| MAE 521 | Linear Control and Design For Mimo Systems | 3 |
| MAE 522 | Non Linear System Analysis and Control | 3 |
| MAE 525 | Advanced Flight Vehicle Stability and Control | 3 |
| MAE 526 | Fundamentals of Product Design | 3 |
| MAE 528 | Experimental Flight Testing | 3 |
| MAE 531 | Engineering Design Optimization | 3 |
| MAE 532 | Smart Structures and Micro-Transducers | 3 |
| MAE 533 | Finite Element Analysis I | 3 |
| MAE 534 | Mechatronics Design | 3 |
| MAE 535 | Design of Electromechanical Systems | 3 |
| MAE 536 | Micro/Nano Electromechanical Systems | 3 |
| MAE 537 | Mechanics Of Composite Structures | 3 |

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|---------|---|-----|
| MAE 538 | Smart Structures and Materials | 3 |
| MAE 539 | Advanced Materials | 3 |
| MAE 540 | Advanced Air Conditioning Design | 3 |
| MAE 541 | Advanced Solid Mechanics I | 3 |
| MAE 543 | Fracture Mechanics | 3 |
| MAE 544 | Real Time Robotics | 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 Engineering | 1-6 |
| MAE 589 | Special Topics In Mechanical Engineering | 1-6 |
| MSE 539 | Advanced Materials | 3 |
| NE 577 | Multiscale Two-phase Flow Simulations | 3 |

Ethics Electives

| Code | Title | Hours |
|---------|---|-------|
| 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.

| Course | Title | Hours |
|------------------------------|--|-------|
| First Year | | |
| Fall Semester | | |
| CH 101 | Chemistry - A Molecular Science ¹ | 3 |
| CH 102 | General Chemistry Laboratory ¹ | 1 |
| E 101 | Introduction to Engineering & Problem Solving ^{1,2} | 1 |
| E 115 | Introduction to Computing Environments ^{1,2} | 1 |
| ENG 101 | Academic Writing and Research ^{1,2} | 4 |
| MA 141 | Calculus I ¹ | 4 |
| Select one of the following: | | 3 |

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|---------|---|--|
| EC 205 | Fundamentals of Economics | |
| EC 201 | Principles of Microeconomics | |
| ARE 201 | Introduction to Agricultural & Resource Economics | |

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|---|--|----|
| GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/) | | 1 |
| Hours | | 18 |

Spring Semester

| | | |
|---------|--|---|
| CSC 113 | Introduction to Computing - MATLAB | 3 |
| GC 120 | Foundations of Graphics | 3 |
| MA 241 | Calculus II ¹ | 4 |
| PY 205 | Physics for Engineers and Scientists I ¹ | 3 |
| PY 206 | Physics for Engineers and Scientists I Laboratory ¹ | 1 |

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|---|---------------------------------|----|
| GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/) | | 1 |
| E 102 | Engineering in the 21st Century | 2 |
| Hours | | 17 |

Second Year

Fall Semester

| | | |
|---------|--|---|
| MA 242 | Calculus III | 4 |
| MAE 206 | Engineering Statics ^{2,3} | 3 |
| MAE 250 | Introduction to Aerospace Engineering | 1 |
| MAE 251 | Aerospace Vehicle Performance ² | 3 |
| PY 208 | Physics for Engineers and Scientists II | 3 |
| PY 209 | Physics for Engineers and Scientists II Laboratory | 1 |

| | | |
|-------|--|----|
| Hours | | 15 |
|-------|--|----|

Spring Semester

| | | |
|---|-------------------------------------|---|
| MA 341 | Applied Differential Equations I | 3 |
| MAE 208 | Engineering Dynamics ^{2,3} | 3 |
| MAE 214 | Solid Mechanics ^{2,3} | 3 |
| MAE 252 | Aerodynamics I ² | 3 |
| MAE 253 | Experimental Aerodynamics I | 1 |
| GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/) | | 3 |

| | | |
|-------|--|----|
| Hours | | 16 |
|-------|--|----|

Third Year

Fall Semester

| | | |
|--|---|---|
| MAE 201 | Engineering Thermodynamics I ² | 3 |
| MAE 361 | Dynamics & Controls | 3 |
| MAE 371 | Aerospace Structures I | 3 |
| MAE 372 | Aerospace Vehicle Structures Lab | 1 |
| English Elective | | 3 |
| Ethics (GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)) | | 3 |

| | | |
|-------|--|----|
| Hours | | 16 |
|-------|--|----|

Spring Semester

| | | |
|---------------|------------------------------|---|
| MAE 351 | Aerodynamics II | 3 |
| MAE 352 | Experimental Aerodynamics II | 1 |
| Math Elective | | 3 |

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|---|-----|
| GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/) | 3 |
| Flight/Space Elective | 3 |
| Structures Elective | 3 |
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| Hours | 16 |
| 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 | 3 |
| Technical Elective | 3 |
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| Hours | 14 |
| Spring Semester | |
| MAE 481 Aerospace Vehicle Design II | 3 |
| GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/) | 3 |
| GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/) | 3 |
| Flight/Space Elective | 3 |
| Technical Elective | 3 |
| <hr/> | |
| Hours | 15 |
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| Total Hours | 127 |

¹ A grade of C or higher is required.

² A grade of C- or higher is required.

³ A 2.5 GPA is required to enroll