

M.S. in Aerospace Engineering

The M.S. in Aerospace Engineering offers a dynamic learning experience that allows students to tailor their academic studies through specialized coursework and research opportunities.

The **Daytona Beach Campus** M.S. in Aerospace Engineering focuses on hands-on learning and advanced research. Students will benefit from cutting-edge facilities and expert faculty guidance. Students will engage in applied aerospace projects covering areas like dynamics and controls, composite materials, large systems, and wind tunnel testing. Housed in the Department of Aerospace Engineering within the College of Engineering, students will have access to the nearby Eagle Flight Research Center, a 10,000-square-foot hangar with runway access at Daytona Beach International Airport. This unique resource offers real-world opportunities to innovate in aircraft and propulsion research.

The **Worldwide & Online** M.S. in Aerospace Engineering allows students to advance their expertise in key areas such as aerodynamics, propulsion, dynamics and control, structures, and materials.

Program-Level Student Learning Outcomes

Daytona Beach

Students will:

- Use analytical methods to analyze and solve engineering problems.
- Use written and oral communication effectively.
- Conduct research and/or independent study.
- Use numerical methods to analyze and solve engineering problems.
- Use experimental methods to analyze and solve engineering problems.

Worldwide

Students will:

- Use analytical methods to analyze and solve engineering problems.
- Use written and oral communication effectively.
- Conduct research and/or independent study.
- Use numerical methods to analyze and solve engineering problems.

Daytona Beach Program Requirements

Core Requirements	6
Graduate Mathematics	3
Option	21
Total Credits	30

Core Requirements

Area of Concentration

Core Requirements based on Area of Concentration

Aerodynamics and Propulsion

Choose Two of the Following:	6
AERO 504 Advanced Compressible Flow	
AERO 521 Viscous Flow	
AERO 528 Advanced Incompressible Aerodynamics	
Thesis Option: complete 12 credits, or Non-Thesis Option: complete 21 credits	12-21
AERO 507 Design, Build and Test	
AERO 508 Intermediate Heat Transfer	
AERO 512 Combustion I	

AERO 516	Computational Aeronautical Fluid Dynamics
AERO 524	Rocket Engine Propulsion Systems
AERO 536	Rotorcraft Aerodynamics
AERO 550	Thermodynamics: Classic and Modern Perspectives
AERO 554	Applied Engineering Analysis
AERO 596	Graduate Internship in Aerospace Engineering
AERO 610	Advanced Computational Fluid Dynamics
AERO 625	Hypersonic Aerospace Propulsive Flows
AERO 631	Aeroacoustics
AERO 635	Flow Stability and Control
AERO 640	Turbine Engine Propulsion Systems
AERO 652	Turbulent Flows
AERO 699	Special Topics in Aerospace Engineering
Total Credits	18-27

Dynamics and Control

Choose Two of the Following:	6
AERO 523 Linear Systems	
AERO 527 Modern Control Systems	
AERO 531 Orbital Mechanics	
AERO 544 Analytical Dynamics	
Thesis Option: complete 12 credits, or Non-Thesis Option: complete 21 credits	12-21
ENGP 505 Spacecraft Dynamics and Control	
AERO 506 Airplane Dynamic Stability	
AERO 526 Engineering Optimization	
AERO 552 Unconventional Aircraft Design	
AERO 553 Hybrid and Urban Air Mobility	
AERO 554 Applied Engineering Analysis	
AERO 596 Graduate Internship in Aerospace Engineering	
AERO 623 Navigation, Guidance and Control	
AERO 626 Advanced Topics in Discrete Control Theory	
AERO 627 Adaptive Control	
AERO 629 Robust Control Systems	
AERO 633 Optimal Control	
AERO 646 Nonlinear Systems	
AERO 654 Geometric Mechanics and Control of Rigid Body Motions	
AERO 678 Estimation of Dynamic Systems	
AERO 699 Special Topics in Aerospace Engineering	
Total Credits	18-27

Structures and Materials

Choose Two of the Following:	6
AERO 502 Strength and Fatigue of Materials	
AERO 510 Aircraft Structural Dynamics	
AERO 522 Analysis of Aircraft Composite Materials	
Thesis Option: complete 12 credits, or Non-Thesis Option: complete 21 credits	12-21
AERO 511 Engineering Materials Selection	
AERO 515 Introduction to the Finite Element Method	
AERO 520 Perturbation Methods in Engineering	
AERO 525 Structural Design Optimization	
AERO 532 Engineering Materials and Failure Analysis	
AERO 534 Smart Materials in Engineering	
AERO 538 Theory of Elasticity	
AERO 540 Structural Health Monitoring	

AERO 542	Mechanics of Structures: Variational and Computational Methods	
AERO 554	Applied Engineering Analysis	
AERO 596	Graduate Internship in Aerospace Engineering	
AERO 606	Finite Element Aerospace Applications	
AERO 612	Analysis of Aircraft Plate and Shell Structures	
AERO 616	Advanced Aircraft Structural Dynamics	
AERO 618	Aeroelasticity	
AERO 648	Thermal Stresses in Aerospace Engineering	
AERO 699	Special Topics in Aerospace Engineering	
Total Credits		18-27

Graduate Mathematics

Students are encouraged to consult an advisor within their respective areas.

Aerodynamics and Propulsion and Structures and Materials Concentrations		
MATH 502	Boundary Value Problems	3
or ENGP 501	Numerical Methods for Engineers and Scientists	
Total Credits		3

Dynamics and Control Concentration		
MATH 532	Numerical Linear Algebra for Engineers	3
or MATH 502	Boundary Value Problems	
or MATH 510	Fundamentals of Optimization	
Total Credits		3

Non-Thesis Option		
Electives (at most six hours of non-AERO courses in Engineering Physics, other Engineering, Math, or SCLM 511, with Program Coordinator approval)		21
Total Credits		21

Thesis Option		
The thesis advisor must be a member of the AE Department faculty.		
To remain on track for Thesis work, the student must submit a Topic Statement upon completion of the first 3 credit hours of Thesis. Upon completion of the second 3 credit hours of Thesis, the student is required to conduct a pre-defense. Consult with the graduate program coordinator for additional information.		
Electives (at most six hours of non-AERO courses in Engineering Physics, other Engineering, Math, or SCLM 511, with Advisor and Program Coordinator approval)		12
AERO 700	Graduate Thesis	9
Total Credits		21

Suggested Plans of Study

Aerodynamics and Propulsion - Non-Thesis Option

Year One

Requirements	Credits
MATH 502 - Boundary Value Problems or ENGP 501 - Numerical Methods for Engineers and Scientists	3
AERO 504 - Advanced Compressible Flow	3

AERO 508 - Intermediate Heat Transfer	3
Semester Hours	9
Requirements	Credits
AERO 521 - Viscous Flow	3
AERO 516 - Computational Aeronautical Fluid Dynamics	3
AERO 550 - Thermodynamics: Classic and Modern Perspectives	3
Semester Hours	9

Total Credits

Total Hours for All Requirements: 18

Year Two	
Requirements	Credits
AERO 504 - Advanced Compressible Flow	3
AERO 610 - Advanced Computational Fluid Dynamics	3
Semester Hours	6
Requirements	Credits
AERO 512 - Combustion I	3
AERO 507 - Design, Build and Test	3
Semester Hours	6

Total Credits

Total Hours for All Requirements: 12

Aerodynamics and Propulsion - Thesis Option	
Year One	
Requirements	Credits
MATH 502 - Boundary Value Problems or ENGP 501 - Numerical Methods for Engineers and Scientists	3
AERO 504 - Advanced Compressible Flow	3
AERO 508 - Intermediate Heat Transfer	3
Semester Hours	9
Requirements	Credits
AERO 521 - Viscous Flow	3
AERO 516 - Computational Aeronautical Fluid Dynamics	3
AERO 700 - Graduate Thesis	3
Semester Hours	9

Total Credits

Total Hours for All Requirements: 18

Year Two	
Requirements	Credits
AERO 700 - Graduate Thesis	3
AERO 610 - Advanced Computational Fluid Dynamics	3
Semester Hours	6

Requirements	Credits
AERO 512 - Combustion I	3
AERO 700 - Graduate Thesis	3
Semester Hours	6

Total Credits

Total Hours for All Requirements: 12

Structures and Materials - Non-Thesis Option

Year One

Requirements	Credits
MATH 502 - Boundary Value Problems or ENGP 501 - Numerical Methods for Engineers and Scientists	3
AERO 510 - Aircraft Structural Dynamics	3
AERO 515 - Introduction to the Finite Element Method	3
Semester Hours	9

Requirements	Credits
AERO 502 - Strength and Fatigue of Materials	3
AERO 522 - Analysis of Aircraft Composite Materials	3
AERO 525 - Structural Design Optimization	3
Semester Hours	9

Total Credits

Total Hours for All Requirements: 18

Year Two

Requirements	Credits
MECH 548 - Introduction to Continuum Mechanics	3
AERO 534 - Smart Materials in Engineering	3
Semester Hours	6

Requirements	Credits
AERO 532 - Engineering Materials and Failure Analysis	3
AERO 618 - Aeroelasticity	3
Semester Hours	6

Total Credits

Total Hours for All Requirements: 12

Structures and Materials - Thesis Option

Year One

Requirements	Credits
MATH 502 - Boundary Value Problems or ENGP 501 - Numerical Methods for Engineers and Scientists	3
AERO 510 - Aircraft Structural Dynamics	3
AERO 515 - Introduction to the Finite Element Method	3
Semester Hours	9

Requirements	Credits
AERO 502 - Strength and Fatigue of Materials	3
AERO 522 - Analysis of Aircraft Composite Materials	3
AERO 700 - Graduate Thesis	3
Semester Hours	9

Total Credits

Total Hours for All Requirements: 18

Year Two

Requirements	Credits
MECH 548 - Introduction to Continuum Mechanics	3
AERO 700 - Graduate Thesis	3
Semester Hours	6

Requirements	Credits
AERO 618 - Aeroelasticity	3
AERO 700 - Graduate Thesis	3
Semester Hours	6

Total Credits

Total Hours for All Requirements: 12

Dynamics and Control - Non-Thesis Option

Year One

Requirements	Credits
MATH 502 - Boundary Value Problems, 510 - Fundamentals of Optimization, or 532 - Numerical Linear Algebra for Engineers	3
AERO 523 - Linear Systems	3
AERO 623 - Navigation, Guidance and Control	3
Semester Hours	9

Requirements	Credits
AERO 527 - Modern Control Systems	3
AERO 506 - Airplane Dynamic Stability	3
AERO 544 - Analytical Dynamics	3
Semester Hours	9

Total Credits

Total Hours for All Requirements: 18

Year Two

Requirements	Credits
AERO 531 - Orbital Mechanics	3
AERO 633 - Optimal Control	3
Semester Hours	6

Requirements	Credits
AERO 544 - Analytical Dynamics	3
AERO 553 - Hybrid and Urban Air Mobility	3
Semester Hours	6

Total Credits

Total Hours for All Requirements: 12

Dynamics and Control - Thesis Option

Year One

Requirements	Credits
MATH 502 - Boundary Value Problems, 510 - Fundamentals of Optimization, or 532 - Numerical Linear Algebra for Engineers	3
AERO 523 - Linear Systems	3
AERO 623 - Navigation, Guidance and Control	3
Semester Hours	9

Requirements	Credits
AERO 527 - Modern Control Systems	3
AERO 506 - Airplane Dynamic Stability	3
AERO 700 - Graduate Thesis	3
Semester Hours	9

Total Credits

Total Hours for All Requirements: 18

Year Two

Requirements	Credits
AERO 633 - Optimal Control	3
AERO 700 - Graduate Thesis	3
Semester Hours	6

Requirements	Credits
AERO 544 - Analytical Dynamics	3
AERO 700 - Graduate Thesis	3
Semester Hours	6

Total Credits

Total Hours for All Requirements: 12

Worldwide Program Requirements

Core Requirements	27
Electives	3
Total Credits	30

Program Details

The Master of Science in Aerospace Engineering requires successful completion of a minimum of 30 credit hours. Students enrolled in the Worldwide Graduate Online program may complete the degree in six terms, or approximately two years, assuming full-time enrollment and continuous progress. Students pursuing this graduate degree must earn a minimum cumulative grade point average (CGPA) of 3.00 for all work completed at the University. The courses required to earn this degree are listed below.

Students should be aware that many courses have prerequisites and/or corequisites. Students are responsible for ensuring that all prerequisite and degree requirements are satisfied prior to enrollment in advanced coursework. The suggested plan of study is provided as a guide. A student's actual plan of study may vary based on term of admission, course availability, transfer credit, and other academic considerations. Students should consult with their academic advisor to develop an individualized plan of study.

Students must complete the required aerospace engineering core curriculum and one approved elective in systems engineering or airworthiness engineering. Students should work closely with their academic advisor to ensure prerequisite requirements are met and courses are completed in the recommended sequence.

Core Requirements

AERO 502	Strength and Fatigue of Materials	3
AERO 510	Aircraft Structural Dynamics	3
AERO 511	Engineering Materials Selection	3
AERO 515	Introduction to the Finite Element Method	3
AERO 522	Analysis of Aircraft Composite Materials	3
AERO 525	Structural Design Optimization	3
AERO 540	Structural Health Monitoring	3
AERO 612	Analysis of Aircraft Plate and Shell Structures	3
MATH 502	Boundary Value Problems	3
Total Credits		27

Electives

Choose One of the Following:	3
AWEN 502	Airworthiness Process and Procedures
AWEN 510	Aircraft Airworthiness Engineering Principles
SYSE 500	Fundamentals of Systems Engineering
SYSE 530	System Requirements Analysis and Modeling
SYSE 560	Introduction to Systems Engineering Management
SYSE 610	System Architecture Design and Modeling
SYSE 625	System Quality Assurance
Total Credits	3

Suggested Plans of Study

One-Year Plan

This one-year plan only works if the degree is started in the January term.

Year One

Requirements	Credits
MATH 502 - Boundary Value Problems	3
AERO 510 - Aircraft Structural Dynamics	3
Semester Hours	6

Requirements	Credits
AERO 502 - Strength and Fatigue of Materials	3
AERO 515 - Introduction to the Finite Element Method	3
Semester Hours	6

Requirements	Credits
AERO 511 - Engineering Materials Selection	3
AERO 540 - Structural Health Monitoring	3
Semester Hours	6

Requirements	Credits
AERO 522 - Analysis of Aircraft Composite Materials	3

AERO 612 - Analysis of Aircraft Plate and Shell Structures	3
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Semester Hours	6
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Requirements	Credits
AERO 525 - Structural Design Optimization	3
Elective	3
Semester Hours	6

Total Credits

Total Hours for All Requirements: 30

Two-Year Plan

Year One

Requirements	Credits
MATH 502 - Boundary Value Problems	3
Semester Hours	3

Requirements	Credits
AERO 502 - Strength and Fatigue of Materials	3
Semester Hours	3

Requirements	Credits
AERO 510 - Aircraft Structural Dynamics	3
Semester Hours	3

Requirements	Credits
AERO 515 - Introduction to the Finite Element Method	3
Semester Hours	3

Requirements	Credits
AERO 511 - Engineering Materials Selection	3
Semester Hours	3

Total Credits

Total Hours for All Requirements: 15

Year Two

Requirements	Credits
AERO 522 - Analysis of Aircraft Composite Materials	3
Semester Hours	3

Requirements	Credits
AERO 525 - Structural Design Optimization	3
Semester Hours	3

Requirements	Credits
AERO 540 - Structural Health Monitoring	3
Semester Hours	3

Requirements	Credits
AERO 612 - Analysis of Aircraft Plate and Shell Structures	3
Semester Hours	3

Requirements	Credits
Elective	3
Semester Hours	3

Total Credits

Total Hours for All Requirements: 15

Estimated Cost of Attendance

Estimated Cost of Attendance: California Student Information (<https://catalog.erau.edu/student-life/student-affairs/california-student/>)