AEROSPACE ENGINEERING SCIENCES - PROFESSIONAL MASTER OF SCIENCE (MSAES)

A professional master's degree (MSAES) in aerospace engineering sciences from CU Boulder is designed for working engineers and people planning to pursue a career in industry. We designed the program with industry partners to meet your needs, further your career and with your location in mind—the degree can be earned on campus or 100 percent online.

For more information, visit the department's Prospective Graduate Students (https://www.colorado.edu/aerospace/prospective-students/graduates/) webpage.

Requirements

Program Requirements

Students must complete a total of 30 credit hours, equivalent to 10 classes, with a grade of B- or better and a cumulative GPA of at least 3.00. Of these 30 credits, at least 24 credit hours must be completed at the 5000 level or above, and at least 18 of those credits must be in Aerospace Engineering (ASEN) courses, and one approved math course. (Note: EMEN 5405 Fundamentals of Systems Engineering counts as an ASEN class. Seminar credits, even those earned in other disciplines, do not count toward the MS degree.)

Up to 6 credits can be taken at the 4000 level in approved engineering, math and science departments (ECEN, CVEN, MCEN, CHEN, CSCI, ATOC, ASTR, PHYS, MCDB, BCHM, MSEN, BMEN, APPM, MATH, STAT, CHEM, IPHY, GEOI, ENV). ASEN courses level 4000 or below do not count towards AES graduate degrees.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASEN Courses</td>
<td></td>
<td>18</td>
</tr>
</tbody>
</table>

Choose from the list below (subject to change)

- ASEN 5007 Introduction to Finite Elements
- ASEN 5010 Spacecraft Attitude Dynamics and Control
- ASEN 5012 Mechanics of Aerospace Structures
- ASEN 5014 Linear Control Systems
- ASEN 5016 Space Life Sciences
- ASEN 5022 Dynamics of Aerospace Structures
- ASEN 5050 Space Flight Dynamics
- ASEN 5051 Fundamentals of Fluid Dynamics
- ASEN 5052 Analytical Astrodynamics
- ASEN 5053 Space Propulsion
- ASEN 5067 Microavionics: Introduction to PIC Microcontrollers for Aerospace Systems
- ASEN 5090 Introduction to Global Navigation Satellite Systems
- ASEN 5111 Introduction to Aeroelasticity
- ASEN 5114 Automatic Control Systems
- ASEN 5121 Boundary Layers and Convection
- ASEN 5131 Introduction to Hypersonics
- ASEN 5148 Spacecraft Design
- ASEN 5151 Fundamentals of Gas Dynamics
- ASEN 5158 Space Habitat Design
- ASEN 5168 Composite Structures and Materials
- ASEN 5212 Large Space Structures Design
- ASEN 5226 Medicine in Space and Surface Environments
- ASEN 5235 Introduction to Atmospheric Radiative Transfer and Remote Sensing
- ASEN 5245 Radar and Remote Sensing
- ASEN 5251 Molecular Thermodynamics and Kinetics
- ASEN 5335 Aerospace Environment
- ASEN 5440 Mission Design and Development for Space Sciences
- ASEN 5519 Special Topics (Molecular Thermodynamics and Kinetics)
- ASEN 5849 Independent Study
- ASEN 6008 Interplanetary Mission Design
- ASEN 6010 Advanced Spacecraft Dynamics and Control
- ASEN 6011 Experimental Spacecraft Dynamics and Control
- ASEN 6014 Spacecraft Fluid Mechanics
- ASEN 6015 Space Vehicle Guidance and Control
- ASEN 6020 Optimal Trajectories
- ASEN 6024 Nonlinear Control Systems
- ASEN 6037 Turbulent Flows
- ASEN 6050 Space Instrumentation
- ASEN 6055 Data Assimilation & Inverse Methods for Earth & Geospace Observations
- ASEN 6060 Advanced Astrodynamics
- ASEN 6061 Molecular Gas Dynamics and DSMC
- ASEN 6070 Satellite Geodesy
- ASEN 6080 Statistical Orbit Determination
- ASEN 6091 Global Navigation Satellite System (GNSS) Receiver Architecture
- ASEN 6092 GNSS for Remote Sensing of the Atmosphere, Ionosphere, and Earth Surface
- ASEN 6107 Nonlinear Finite Element Methods
- ASEN 6114 System Identification for Control
- ASEN 6116 Spacecraft Life Support Systems
- ASEN 6216 Human Operation of Aerospace Vehicles
- ASEN 6265 Fundamentals of Spectroscopy for Optical Remote Sensing
- ASEN 6316 Extravehicular Activity
- ASEN 6331 Computational Fluid Dynamics
- ASEN 6337 Remote Sensing Data Analysis
- ASEN 6365 Lidar Remote Sensing
- ASEN 6519 Special Topics
- EMEN 5405 Fundamentals of Systems Engineering

Math Course
Choose from one of the following approved options:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASEN 5044</td>
<td>Statistical Estimation for Dynamical Systems</td>
</tr>
<tr>
<td>ASEN 5137</td>
<td>Experimental Design and Statistical Methods</td>
</tr>
<tr>
<td>ASEN 5307</td>
<td>Engineering Data Analysis Methods</td>
</tr>
<tr>
<td>ASEN 5417</td>
<td>Special Topics (Multi-Object Filtering Theory)</td>
</tr>
<tr>
<td>ASEN 5519</td>
<td>Uncertainty Quantification</td>
</tr>
<tr>
<td>CSCI 5636</td>
<td>Numerical Solution of Partial Differential Equations</td>
</tr>
<tr>
<td>ECEN 5612</td>
<td>Random Processes for Engineers</td>
</tr>
<tr>
<td>ECEN 5632</td>
<td>Theory and Application of Digital Filtering</td>
</tr>
<tr>
<td>ECEN 5652</td>
<td>Detection and Extraction of Signals from Noise</td>
</tr>
<tr>
<td>EMEN 5005</td>
<td>Introduction to Applied Statistical Methods</td>
</tr>
<tr>
<td>4000, 5000, 6000, or 7000 level APPM course</td>
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<tr>
<td>4000, 5000, 6000, or 7000 level MATH course</td>
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</tr>
<tr>
<td>4000, 5000, 6000, or 7000 level STAT course</td>
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</table>

**Additional Coursework** 9

**Total Credit Hours** 30

**Time Limit**

All degree requirements must be completed within four years of the date of commencing coursework.