CURRICULUM GUIDE

AERONAUTICAL SCIENCES

Professional Flight Officer
Aviation & Aerospace Management
Aerospace Operations
Air Traffic Control
Unmanned Aircraft Systems
Air Force ROTC Affiliation

SPACE SCIENCES

Aerospace Advanced Manufacturing
Aerospace Systems Technology (AST)
Aerospace Physics
Space Commercialization

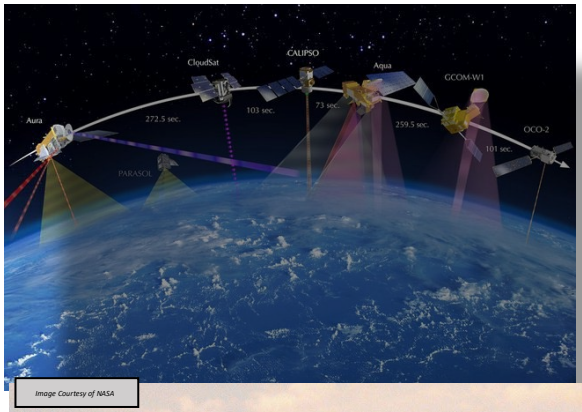
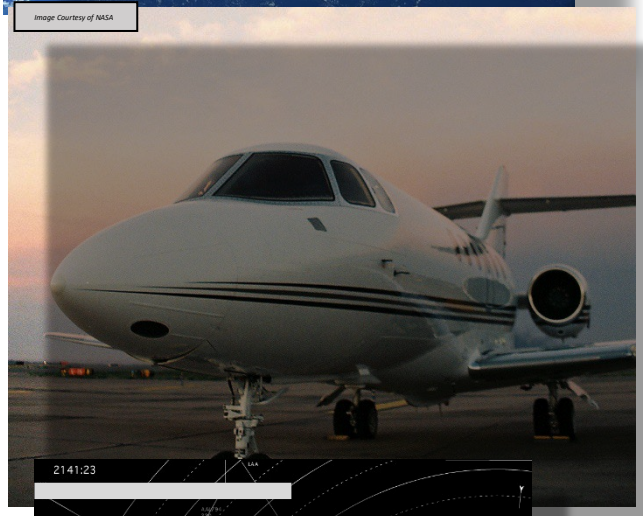


Image Courtesy of NASA



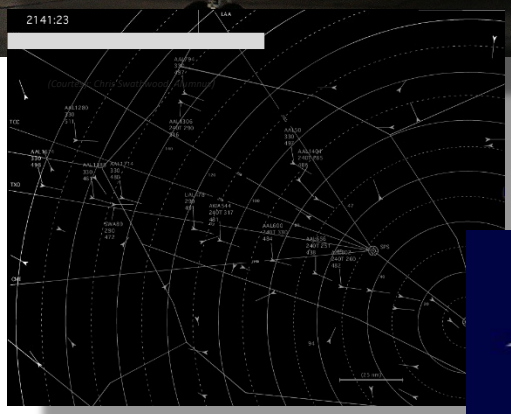


Image Courtesy of NASA

Aviation and Aerospace Science Department

College of Aerospace, Computing, Engineering and Design (ACED)

Metropolitan State University of Denver

2024 - 2025

March 2025 Edition 17

MSU DENVER
PRECISION FLIGHT TEAM

METROPOLITAN STATE UNIVERSITY OF DENVER

NEW Student Checklist – Aviation and Aerospace Science (AVS)

1. **Apply to the University:** Prospective students should apply for admission by walk-in at the Student Success Building (SSB), Room 180, or by filling out an application form online at www.msudenver.edu/admissions/, or by phone at 303-556-3058.
2. **Have Transcripts sent to MSU Denver:** Contact all high schools and colleges attended and request that an official transcript be sent to MSU Denver. Request MSU Denver evaluation of all college transcripts. If you are transferring academic credit, visit MSU Denver Transfer Services at https://msudenver.edu/admissions/student-types/transfer/
3. **Schedule both an MSU Denver Orientation and a General Advising Session:** For new or transfer student orientation, contact the Office of New Student Orientation at 303-615-0770 or visit https://msudenver.edu/otr/ To request a general advising session, contact the AVS Front Office at 303-605-5287 and schedule an appointment with Emily Dolezal or Michael Felton.
4. **Schedule an appointment with a faculty member of the Aviation & Aerospace Science Department (AVS) for academic advising:** Contact the AVS Department at 303-605-5287 to establish an appointment for advising in your major, or go to Seventh Street Building, Room 102 and schedule an appointment in-person.
5. **Declare your AVS Major: New students should declare a major (and a minor or certificate program if applicable) as soon as possible. Declare your Major along with a specific concentration during your first advising session with any full-time Aviation & Aerospace Science professor.**
6. **Register for Classes:** For registration, follow the Register tab of StudentHub http://www.msudenver.edu/studenthub/ for procedures and dates.
7. **Establish an Email Account:** Students are provided free email access. All AVS Majors must establish and monitor their MSU Denver email account. You may retrieve or send email, monitor university information, and access your personal records through your StudentHub account at: https://www.msudenver.edu/studenthub/
8. **Review MSU Denver Catalog:** Students should access and review the MSU Denver Catalog in effect at the time they enter MSU Denver. Please see: http://catalog.msudenver.edu/index.php
9. **Acquire Degree Progress Reports:** All AVS majors must have a current Degree Progress Report for advising with any full-time faculty. Degree Progress Reports may be obtained by the student through StudentHub under the 'Degree Progress Report' link. Also see: https://degreeworks.msudenver.edu/Dashboard/
10. **Obtain FAA Medical Certificate:** Before enrolling in the ASC2 concentration, and before initiating flight training, students should ensure that they can obtain the appropriate FAA medical certificate. See www.faa.gov/pilots/amelocator/. Consult a faculty advisor for details.
11. **Individualized Degree Program (IDP):** If you are seeking any of the IDP degree programs listed in this guide, visit http://www.msudenver.edu/cil/ and contact Dr. Forrest for further information.
12. **Registration for Certificate in Airport Management, Space Commercialization, or Unmanned Aircraft Systems:** You must register with the AVS Department prior to graduation.
13. **Review AVS Department Student Code of Conduct: https://www.msudenver.edu/aviation-aerospace/avs-student-code-of-conduct/**

*(Some images contained within courtesy of **NASA** unless otherwise noted.)*

Metropolitan State University of Denver

Aviation and Aerospace Science Department

Seventh Street Classroom Building
1250 7th Street, Room 102, Campus Box 30, P.O. Box 173362
Denver, Colorado 80217-3362,
Office Phone: (303) 605-5287

(*Image by* ***Paul Gordon*** */ Bluedharma* ©)

MSU Denver's Role and Mission

MSU Denver is a comprehensive, baccalaureate- and master's-degree granting urban university that offers arts and sciences, professional and business courses and programs to a diverse student population in an atmosphere of mutual respect. Excellence in teaching and learning is MSU Denver's primary objective.

MSU Denver's mission is to provide a high-quality, accessible, enriching education that prepares students for successful careers, post-graduate education and lifelong learning in a multicultural, global and technological society. To fulfill its mission, MSU Denver's diverse university community engages the community at large in scholarly inquiry, creative activity and the application of knowledge.

Welcome to

Aviation and Aerospace Science

at MSU Denver!

Founded in 1965, Metropolitan State University of Denver is Colorado's urban land grant university, located on the historic Auraria Campus in downtown Denver. Offering individualized, relevant bachelor's degrees as well as select bachelor and graduate level degrees, MSU Denver educates more undergraduate Coloradans than any other collegiate institution in the state. Established in 1965 and with an enrollment of approximately 20,000 students, MSU Denver is considered a leading institution in the region with over 100,000 graduates!

The Aviation and Aerospace Science Department (AVS) at MSU Denver is one of the largest and most advanced collegiate aviation programs in the country and offers access to many valuable resources instrumental to the success of our students. The Department's Aeronautics and Aerospace Systems Laboratories (AAS), located on campus, features ultra-modern FAA-approved single and multi-engine flight training devices, aerospace computer-based training systems, live space-based satellite operations and simulations, UAV/UAS operations, full-featured advanced flight labs, and Air Traffic Control training simulation. The Denver area, long a national epicenter of aviation and aerospace commerce, offers numerous area airports, flight schools, and aerospace operational centers – along with great opportunity for employment after graduation!

MSU Denver's Precision Flight Team has been recognized as one of the top competitive aviation programs in the United States through NIFA national competitions. Our Aerobatics Team ranked first place in the 2017, 2019, 2021, and 2022 IAC national competition. Of great significance is that our Aviation & Aerospace Science Department has been honored by the City of Denver and has also been recognized by the State of Colorado Legislature as a State of Colorado recorded Educational Asset, established on strong academics, community involvement, aviation and aerospace skills, safety and an ability to advance the profession and the ***success of our students***!

MSU Denver Aerobatic and Glider Club competitors at Midwest Aerobatic Championships, Seward, NE, KSTK

Department Mission

The Mission of the MSU Denver's Department of Aviation and Aerospace Science is to provide affordable, flexible, and accessible aviation and aerospace education and training programs to a diverse student body that prepares our students for and provides access to local, state, and national career opportunities.

Aviation and Aerospace in Colorado

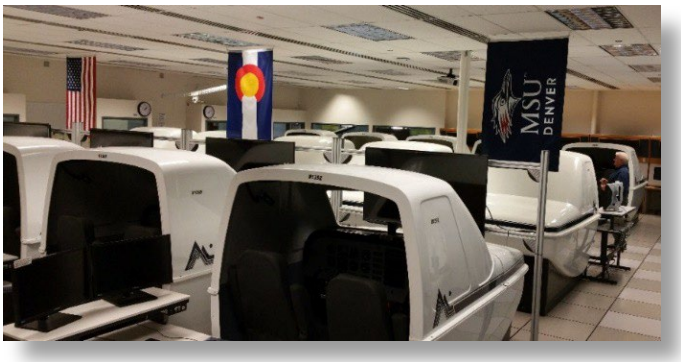
Since the early 20th Century, Colorado's aviation and aerospace industry has grown and continues to thrive – especially in the professions of the professional flight officer, aviation and airline operations, airport management, commercial space systems, military space operations, and government space systems and space vehicle mission operations!

Today, Colorado boasts the nation's largest entrepreneurial-based aerospace economy, with well over 400 employers either classified as aerospace companies or serving as suppliers to the aviation and aerospace industries. Metro Denver is ranked second among the largest metropolitan areas for aerospace industry cluster employment concentration, and first in the nation for private aerospace employment. In all, over 163,000 professionals are working in aerospace related Colorado jobs!

Several of the nation's top aerospace contractors have a large presence in Colorado, including Lockheed Martin, Ball Aerospace, Raytheon, Northrup Grumman, Jeppesen-Boeing, and ITT Industries. These companies provide valuable military assets to the Department of Defense, as well as supplying instrumentation, spacecraft, and ground control services to the National Aeronautics and Space Administration (NASA) and many for-profit entities. Private companies in the Denver Front Range area enjoy the benefits of being central to aviation and aerospace commerce. Companies such as York Aerospace, Ball Aerospace, Maxar/DigitalGlobe, Bye Aerospace, Sierra Space, and United Launch Alliance are also based or have a significant presence in the state!

Home to one of the healthiest and most highly-educated adult populations in the U.S. and surrounded by the natural beauty of the Rocky Mountains, it is no surprise that Colorado continues to be a hub for the industry, acting as a magnet for big-name aviation and aerospace companies and high-caliber talent.

Colorado is a center for innovation in aviation and aerospace, in particular, the development of new types of aircraft-spacecraft and in the development of commercial space applications. Ongoing close contacts with the many aviation and aerospace businesses and entities in Colorado provide employment, cooperative education, research, and internship opportunities for students and graduates.



Aeronautics and Aerospace Systems Laboratories - Main lab of the Robert K. Mock Flight Simulation Lab

Vision Statement:
The Vision of the MSU Denver's Aviation and Aerospace Science Department is to develop strong legislative, industry, and philanthropic support to expand the aviation and aerospace programs, including undergraduate and graduate degrees and professional certifications, thereby fulfilling the demands and needs of our students and related industries.

AVS Department Directory

FACULTY

Jeffrey Forrest, Ph.D. - Professor & Department Chair - Aerospace Technology, Internships & Individualized Degree Program

303-615-1194 | forrestj@msudenver.edu | BA Geography, University of North Carolina Charlotte; BS Aviation Technology, MSU Denver; MA Space Systems, Webster University; MAS Management, Embry-Riddle Aeronautical University; Ph.D., Information Science, Certificate: National Security Affairs and International Affairs, NSU Florida. COM, SEL, SES, MEL, Glider, IA, AGI-IGI, Type HS-125 & CL- 600. Specializes in: space science, space commercialization, research methods, aviation & aerospace information policy, and human-computer interaction.

Michael Botyarov, Ph.D. – Assistant Professor & Associate Chair

mbotyaro@msudenver.edu | MBA CU Denver, MS Systems Engineering Embry-Riddle Aeronautical University, BS Aerospace Systems Engineering Technology MSU Denver. Specializes in: Project Management and Human Systems Engineering as applicable in Aerospace Operations.

Kevin Kuhlmann, M.A.S. – Professor - Airline Operations, Safety, and Pathways, AT- CTI (ATC), Military and AFROTC, and Transfer Student Advisor

303-615-1196 | kuhlmank@msudenver.edu | BS, Southern Illinois; MAS Embry-Riddle Aeronautical University. ATP, CFI-I, MEI, AGI-IGI, Type: BE-1900D. Specializes in: safety & human factors, flight training, Technologically Advanced Aircraft systems, and airline and military aircraft operations.

Tyler Bachelder, M.S. – Associate Professor - General Aviation & Flight Training Advisor & Transfer Student Advisor

303-615-1218 | bacheldt@msudenver.edu | BS Aeronautics, University of North Dakota; MS Aviation, University of North Dakota; COM SEL, MEL, CFI, CFI-I, MEI. Specializes in technologically advanced aircraft, flight training, simulator and ground school instruction.

Chad Kendall, M.B.A. - Associate Professor- FAA Chief Instructor, TSA Provider Agent, General Aviation & Flight Training Advisor, Airline and Corporate Pilot Careers, Coach of Precision Flight Team

303-605-7224 | ckendal4@msudenver.edu | BS Aviation Management & Flight Operations, Jacksonville University; MBA, Jacksonville University. ATP-MEL COM-SEL, CFI-IA, AGI-IGI, SIC Type: CL-65, EMB-145. Specializes in: flight/ground training, advanced systems, jet transition training, aviation curriculum, psychophysiology, NIFA precision flight team

Derren Duburguet, M.A. - Professor - Airline Careers, Meteorology, & Flight Training / Airline Advisor

303-615-1205 | duburgue@msudenver.edu | AS Aviation, Mesa College; BA & MA Physical Geography, San Diego State; ATP, CFI-IA, MEI, PIC Type Bombardier Dash 8 Q-400, SIC Type Ratings SAAB 340 & Embraer 145. Specializes in: regional airline operations, flight training, aircraft performance, remote sensing, computer systems engineering, and career planning.

George G. King, M.S. – Professor - Flight Training Advisor

303-615-1207 | kingge@msudenver.edu | BS & MS Engineering Systems Analysis, Rensselaer Polytechnic Institute. COM CFI-IA, AGI-IGI, SEL, MEL, Glider. Specializes in: aerodynamics, technically advanced aircraft, aviation weather, and ground school instruction.

Jeffrey C. Price, M.A. – Professor - Aviation Management, Career Planning, Internships, AAAE

303-615-1210 | pricej@msudenver.edu | BS Prof. Pilot, MSU Denver; MA Education, Colorado Christian; COM SEL, IA, AGI-IGI. Specializes in: airport planning & security management, career planning, and AAAE Certified Member program.

Casey Phinney, M.A. – Assistant Professor – Unmanned Aerial Systems Advisor

303-605-3362 | phinney@msudenver.edu | BA, Western State College; MA Educational Administration, Western Colorado University; MA Teacher Leadership, Western Colorado University; COM Helicopter, CFI, CFI-I, BGI, Private SEL. Specializes in: ground school instruction, flight training, unmanned aerial systems and simulators.

LECTURESHIP FACULTY

Laura Braunschmidt, B.S. – Lecturer - General Aviation & Flight Training
303-605-7223 | lbraunsc@msudenver.edu | AS, Arapahoe Community College, BS Aviation Science – Professional Flight Officer, Utah Valley University; ATP, SEL, MEL, IA, AGI-IGI, PIC Type: CL-65. Specializes in: flight training, simulator and ground school instruction.

Dagmar Kress, M.B.A. – Lecturer – Aerobatic Team Coach | 303-605-5123 | dkress3@msudenver.edu | MBA, University of New Mexico, École Hôtelière de Genève, Geneva, Switzerland, Diplôme. ATP, CFI-IA, MEI. Specializes in: competitive flight operations and training – IAC and NIFA coach, general aviation flight training, airshow demonstrations.

Jose M. Lopez, M.S. – Lecturer - STK, Astronautical/Aeronautical Engineering Advisor
303-605-5287 | jlopez93@msudenver.edu | BS Aerospace Engineering, St. Louis University, MS Aerospace Engineering, University of Tennessee; Raytheon – engineering manager (ret), USAF Colonel (ret), Master Space Badge. Ansys STK certified. Specializes in: astrodynamics, energy systems, space science & systems, space operations, and AGI Systems Tool Kit (STK).

Randy Owen, M.S., M. Eng. – Lecturer - STK, Astronautical/Aeronautical Engineering Advisor
303-615-1220 | roweniii@msudenver.edu | BS Electrical Engineering, Cornell University; MS Electrical Engineering, Air Force Institute of Technology; MEng Engineering Management, University of Colorado. Specializes in: Space Science, Spacecraft Engineering and Operations, Electrical Engineering.

Annmarie Heth, M.S. - Lecturer - Aviation Management
aheth@msudenver.edu | B.A. in Communications The Ohio State University. M.S. in Aviation Administration Middle Tennessee State University. C.M. ACE-Security. Specializes in: aviation safety, aviation security, airline & airport planning/management, air cargo, and aviation law.

George Nolly, D.B.A. – Lecturer - General Aviation & Flight Training Advisor
303-605-5126 | gnolly@msudenver.edu | BS Electrical Engineering, United States Air Force Academy; MS Systems Management, University of Southern California; D.B.A. Homeland Security (Aviation), Northcentral University. ATP Certificate: B-727, B-737, B-777, B-787, Learjet, CE-680, BGI, AGI, IGI. Specializing in: Simulator instruction, Aviation Weather, and ground school instruction.

J.D. Garvin, Ed.D. – Lecturer - General Aviation & Flight Training
303-605-7223 | jogarvin@msudenver.edu | EdD, Texas Tech University, MBA, Strayer University, MPA, Northern Michigan University, BS, Electrical Engineering Southern Illinois University.
Command Pilot, Senior Space Officer, USAF (retired); SEL, MEL, CFII.

ADJUNCT LECTURESHIP FACULTY

Candace Brown, M.S.M. – Instructor
cbrow161@msudenver.edu | MSM Embry-Riddle Aeronautical University, AAE, PMP, ACE-Security, PPL, NIMS. Specializes in: Airport Management

Donovan Devasher, M.A.S. – Instructor
ddevashe@msudenver.edu | MAS Management & Human Factors Embry-Riddle Aeronautical University, BA Land Use – Urban Planning MSU Denver, BS Aviation & Aerospace Science – Professional Flight Officer Concentration MSU Denver. ATP, CFI. Specializes in: Air Carrier Pilot Instruction as IP, Safety and QA systems for Business Aviation, Air Carrier Flight Standards, Human Factors Analysis and Research, RCA, Aviation Project Management, Technical Writing of Publications and Manuals. Aviation Real Estate Feasibility Analysis, Airport, FBO and Aeronautical Commercial Property Development...

Tanya Bulleigh, Ph.D. – Instructor
tgatlin@msudenver.edu | MS Physics University of Houston, BS Aviation Management MSU Denver. ATP, MEL, CFI-IA, MEI. Specializes in: Aerospace Communications & Systems, Flight Training, Ground School Instruction.

Richard Thureau, Ph.D. – Instructor
rthurau2@msudenver.edu | Ph.D. Environmental Science Indiana University, MS Forest Resource Management Southern Illinois University, BS Forestry Southern Illinois University. FAA Part 107 UAS Pilot. Specializes in: Unmanned Aircraft Systems training for project management, emergency response, photogrammetry, remote sensing and GIS programming.

Michael L Forney, MCIS - Instructor
mforney@msudenver.edu | BS University of Colorado - Applied Mathematics. Master of Computer Information Systems University of Denver. Commercial pilot single and multi-engine airplane with Instrument rating. National and International Aerobatic Judge and competing in the Advanced category aerobatics.

Leo Garcia, B.S M.S. – Instructor
lgarc147@msudenver.edu | MS. Aviation & Aerospace Operations dual with Human Factors. Embry-Riddle Aeronautical University, Florida. B.S Aviation Technology, Everglades University, FL. . FAA: Commercial Pilot, Instrument, Multi-Engine, Flight Engineer, Aircraft Dispatcher, Advance Ground Instructor (AGI) and Part 107 Certified. Specializes in: Unmanned Aircraft & Space Systems Operations and Training.

Zachary Lautzenheiser - Instructor
zalautzenh@msudenver.edu | BS Jacksonville University – Aviation Management and Flight Operations. ATP, AMEL, Commercial ASEL, ASES, CFI, CFII, MEI. Specializes in: Corporate Aviation and Aircraft Management.

AERONAUTICS AND AEROSPACE SYSTEMS LABORATORIES

Josh Carrier, B.S. – Technical Operations Manager - Aeronautics and Aerospace Systems Laboratories
303-605-7217 | jcarrie4@msudenver.edu | BS Aviation Science. Specializes in laboratory operations and simulator maintenance.

AVS OFFICE MANAGEMENT

Kiha Sutta, M.S. – Associate Director of Community Engagement & Administration
303-605-7384 | kisutta@msudenver.edu | MS Exercise and Sport Administration, BS Kinesiology, Minor in Nutrition. Specializes in: Outreach, Student Advising, and Front Office Operations.

Thomas Shriver, B.S. – Student Retention & Academic Program Analyst - Administration and Student Advising
303-605-7216 | tshriver@msudenver.edu | BS Aviation & Aerospace Science MSU Denver; CPL, IRA, AGI, IGI. Specializes in: Advanced Program-level advising, Program Analysis, Department Website Maintenance, Curriculum Development, Ground Instruction.

Academic Advisors - College of Aerospace, Computing, Engineering and Design (ACED)

General Studies (GS) requirements and College of Aerospace, Computing, Engineering and Design Degree Requirements. Available by appointment or inquire about walk-in office hours in Seventh Street Classroom Building (7S) 126F, or by phone:

Emily Dolezal
Aviation and Aerospace Academic Advisor, College of Aerospace, Computing, Engineering and Design
303-605-5287 | edolezal@msudenver.edu

Michael Felton
Aviation and Aerospace Academic Advisor, College of Aerospace, Computing, Engineering and Design
303-605-5287 | mfelton1@msudenver.edu

SpaceTech Scholars

MSU Denver's Colorado SpaceTech Scholars program is committed to developing a pipeline for MSU Denver students seeking careers into growing Colorado Aerospace—centered industries. Within MSU Denver, it is a program dedicated to undergraduate student success, diversifying these industries from the underrepresented communities served by MSU, and engaging K-12 partners in equitable STEM access as well as specialized professional identity development. The scholarship program is federally funded by the Department of Education for Hispanic Serving Institutions of Higher Education and is part of MSU Denver's broader Hispanic Serving Initiatives.

This program is for any MSU Denver student pursuing a degree in the Aerospace/Aeronautics or engineering, and/or technician fields within the College of Aerospace, Computing, Engineering, and Design (CACED). The SpaceTech learning community is based on a cohort program model with goals of retention, engagement, community building, and professional development. Ultimately, students will partake in courses, programming, events, workshops, and industry tours strategically planned to guide them to eventually graduate with the knowledge, skills, and connections to succeed in their respective career pathway.

Please reach out to our team if you are interested in receiving support from the affiliated yearly scholarship.

Roberto De Mata, M.A.
Project Manager
rdemata@msudenver.edu

Maria Ratliff, M.Ed.
Outreach Coordinator
lratlif4@msudenver.edu

Lisa Bertoson
STEM Community Coordinator
libertoson@msudenver.edu

Overview & General Information

Department Policies Students should first fill out a Declaration of Major/Minor form, available in the AVS Office or from Central Advising, indicating their major and concentration. With the help from the AVS office staff, establish an initial appointment with a faculty advisor. Meet with a faculty advisor each semester for general advising; staff and faculty advisors will be available to assist you throughout your university career. Become acquainted with all AVS faculty and staff and do not hesitate to ask questions or seek guidance if problems arise.

Certain FAA pilot certificates and ratings are required for the completion of the Professional Flight Officer concentration (ASC2) and some minors. University credit for flight courses may be used if transferred from an accredited college aviation program. Flight training is completed independently. Flight courses (graded as Satisfactory or Unsatisfactory) may be taken to obtain additional financial aid to be applied to the cost of flight training. Consult your advisor and the financial aid office for details.

Any MSU Denver catalog in effect since initial enrollment may be used, provided enrollment is not interrupted by an absence of three consecutive semesters, including summer. Consult the AVS website at www.msudenver.edu/aviation/ for other AVS student-related information.

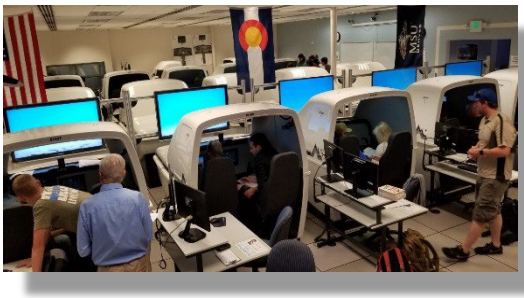
Student Issues Committee Requests for issues as related to AVS program requirements must be made in writing. Include a current Degree Progress Report and written rationale for the requested consideration. The rationale must be sufficiently complete for faculty to clearly understand the circumstances. Requests are submitted to the AVS Student Issues Committee. Please email Professor Kevin Kuhlmann regarding any related issues (kuhlmank@msudenver.edu).

Aeronautics and Aerospace Systems Laboratories

The Aviation & Aerospace Science Department hosts an extensive array of laboratories for simulation and hands-on training. Our Aeronautics and Aerospace Systems Laboratories (AAS Labs) consist of nine state-of-the-art technology facilities for enhanced academic and applied knowledge mastery as related to the student's chosen field of study. The AAS Labs support all aspects of our academic and technology programs – including flight simulation training, advanced avionics functions, air traffic control operations, space satellite mission operations and systems engineering, aerospace physics, UAV/UAS, and aeronautics and aerospace data analysis.

The AAS Labs include aeronautics and aerospace technologies focused on providing students real-time / real-life simulation experiences integrated with traditional classroom learning. The laboratories include the general aviation Robert K. Mock Flight Simulation Laboratory, the Astronautics Simulation Laboratory, the Satellite Engineering Laboratory, the Air Traffic Control Laboratory, the Corporate and Commercial Jet Laboratory, the UAS/UAV Laboratory, the Aeronautics Simulation Laboratory, the Balloon Sat Laboratory, and the Aerospace Operations Laboratory.

Robert K. Mock Flight Simulation Laboratory



The AAS Labs are comprised of individual flight training devices (FTDs) and simulation systems for general aviation aircraft and avionics. The AAS Labs include 10 single engine Cessna 172s, five Cessna 172XP G1000 simulation systems, five Piper Seminole light-twin simulation systems, and two Beech 1900D turboprop simulation systems.

All the single engine, light-twin, and turboprop FTD's are configured with modern GPS units. Specific FTDs include Garmin 1000 GPS and Avidyne Entegra "glass cockpit" advanced technology. The AAS Labs also supports advanced weather planning and forecasting technologies, flight plan filing and IFR chart services, and a variety of other supporting flight planning resources. In particular, the AAS Labs proudly hosts the Jeppesen-Boeing Flight Planning area, providing resources for preparation and filing flight plans, printing of navigation charts, maps, approach plates, and other planning materials for student use.

Air Traffic Control Laboratory

The AAS Labs include an 18-controller position Air Traffic Control (ATC) system providing simulation of an operational air traffic control radar facility. The ATC Laboratory is recognized as an FAA Collegiate Training Initiative (AT-CTI) school, a specialized training designation given by the FAA only to select higher education institutions.

Corporate and Commercial Jet Laboratory

The AAS Lab also features corporate and commercial jet simulation and training systems. The Cessna Mustang business jet is featured with a full 220-degree wrap-around theater-style visual system. Built to the exact Cessna C510 configuration, the corporate jet also includes the full Garmin 1000 multifunction glass flight deck.

The Bombardier Canadair 700 Regional Jet (CRJ700) is also featured, simulating the entire CRJ 700 model aircraft. They are additionally equipped with advanced training features covering all the aircraft's systems with live touch screens for in-depth training on all aspects of the aircraft's subsystems. A full CRJ 700 flight model is complemented by the entire suite of the aircraft's avionics and flight controls. Also included are four FMS tactile units that interface with CRJ training software in the Jet Lab.

Aeronautics Simulation Laboratory

As part of the AAS Labs, the Aeronautics Simulation Laboratory provides an advanced technology platform for training and simulation of advanced avionics and navigation systems, glass flight deck systems, and Flight Management Systems (FMS) found on technically advanced aircraft. Glass flight deck training platforms include the Garmin 430/530 GPS systems, Garmin 1000 systems, Avidyne Entegra systems found on many general aviation aircraft, and Flight Management Systems (FMS) found in common commercial jet aircraft.

Aerospace Operations Laboratory

The Aerospace Operations Laboratory is a fully functioning Satellite Mission Operations Center (MOC) and provides students real-world hands on training for monitoring, controlling, and tracking of satellites, A custom technology platform for both simulated and actual operational satellite control, and a satellite data analytics network are unique resources available to students in the MOC.

Astronautics Simulation Laboratory

The Astronautics Simulation Laboratory (ASL) provides commercial space simulation technology and is an official training center for *Ansys Corp. Systems Toolkit* (STK). The lab features 18 student computer stations with dual displays as well as dual projection of the displays from the instructor station. The space commercialization simulation technology provides a programming platform for developing "what-if?" scenarios for a variety of earth- and space-based projects and is an industry standard application for large and small aerospace companies globally.

Balloon Satellite Laboratory

Additional AAS Labs resources provide technology for building and flying "balloon satellites" for field data collection and subsequent analysis. High altitude balloon payloads are designed and built by students for launch each semester. Research papers and presentations are a product of the design/build/launch/retrieval/analysis process. This provides the opportunity for students to fly independent study research projects.

Satellite Engineering Laboratory

The Satellite Engineering Laboratory (SEL) Lab provides students a laboratory environment to work with the local aerospace community on company-driven specific projects, including new design specifications, satellite programming and operations activities, and a variety of subsystems projects. Students typically shadow aerospace engineers in completing design work, script/program writing, simulation analysis, and launch planning and logistics.

Unmanned Aircraft Systems Laboratory

The Unmanned Aircraft Systems Laboratory (UAS) Flight Training Laboratory provides students access to UAV/UAS flight simulation technology for introductory flight skills development. Additional UAS Lab resources include an inhouse flight cage, ground control station operations, and extensive data collection/analysis toolsets and applications. A formal structure of coursework is offered to interested students for acquiring a certificate in UAS Operations.

Launch of STS 102 – 2001 (Jeff Forrest)

Flight Courses & Optional Financial Aid

Optional financial assistance towards flight training is available when you enroll in the flight course associated with your specific flight training: AES 1500 (Private), AES 2500 (Instrument), AES 3520 (Commercial), and AES 4500 (Multi-Engine) OR AES 4510 (Flight Instructor). Please visit our YouTube Channel and watch the flight costs and financial aid video. A copy of the Budget Adjustment form is available below and must be given to MSU Denver Financial Aid after signing up for your flight class, and only if you are pursuing the optional financial assistance. If you have additional questions, please consult Prof. Chad Kendall ckendal4@msudenver.edu for more information. (*subject to requirements and approval of U.S. Student Federal loans – see MSU Denver Financial Aid office for details).

Additional Elective Flight Courses are available for students wanting aid for additional FAA certificates and ratings:

AES 4520 (Flight Instructor-Instrument), AES 4530 (Flight Instructor – Multi-Engine), or AES 4550 (Flight Helicopter), AES 4570 (Airline Transport Pilot), or AES 4580 (Flight Engineer/Turbojet)

Flight and Ground Instructor Practicum Courses

Student flight or ground instructors may obtain instructional experience by enrolling in elective practicum classes – AES 3570 (Ground Instructor Practicum) or AES 4590 (Flight Instructor Practicum). Flight or Ground Instructor students can obtain elective credit for serving as Teaching Assistants in AES Ground or Simulator courses, as well as gain elective credit as a flight instructor working with a flight training provider. Flight simulator courses offered in the WIA include AES 1710 Instrument Flight Simulation I; AES 2710 Instrument Flight Simulation II; and AES 3710 Multi-engine Flight Simulation. Contact the Aviation & Aerospace Department for additional information.

Credit for FAA Certificates & Ratings or Prior Aviation / Aerospace Experience

Students enrolling in AVS programs who already have FAA flight certifications and ratings or other related and documented aviation experience should seek advising with Prof. Chad Kendall ckendal4@msudenver.edu or Professor Tyler Bachelder bacheldt@msudenver.edu to evaluate any available options for course substitution or transfer credit.

Precision Flight Team

MSU Denver's Precision Flight Team has been recognized as one of the top collegiate aviation programs in the United States, being awarded the 2011 Loening Trophy, the oldest and most prestigious award in collegiate aviation. The Precision Flight Team competes in annual regional and national competitions with other members of the National Intercollegiate Flying Association (NIFA). Competition includes precision landings, navigation, message drop, simulator, E6-B, and aircraft recognition. The team also participates in community service and fund-raising activities. For more information on joining the team, consult Coach Chad Kendall at ckendal4@msudenver.edu.

Aerobatic Team

The Aerobatic Team provides an opportunity for students to explore aviation outside the standard flight training curriculum required for certification. Students interested in aerobatics can take an orientation flight, performing rolls, loops, Cuban eight type maneuvers, inverted flight, stalls and spins, hands on, with assistance of an experienced aerobatic instructor. The formal aerobatic training syllabus then expands into stall/spin recognition and recovery training, exploring accelerated stalls, right side up as well as inverted flat, accelerated, switch over, crossover spins, and inadvertent spin and unusual attitude recoveries. After completion of spin training the aerobatic students will receive the opportunity to apply their newly acquired knowledge, while learning to master the maneuvers of the Sportsman aerobatic competition category, including Immelmann, Hammerhead, Humpty Bump, etc. The MSU Denver Collegiate Aerobatic Team participates in International Aerobatic Club (IAC) sanctioned aerobatic contests around the country. (See www.IAC.org, collegiate program. Students usually compete in the Primary or Sportsman aerobatic category. Contact Faculty Head Coach Dagmar Kress dkress3@msudenver.edu for more information.

American Association of Airport Executives (AAAE)

The MSU Denver student chapter of the AAAE invites all aviation students to become members of AAAE. The goal of the AAAE student chapter is to promote professional development and instill professional attitudes in students engaged in the study of airport development, administration, management and operation, and related fields of aviation. AAAE is the world's largest professional organization for airport executives, representing thousands of management personnel at public-use airports nationwide. The primary goal of the AAAE is to assist airport executives in fulfilling their responsibilities to the airports and the communities they serve. Please contact Professor Jeffrey Price pricej@msudenver.edu for details.

Airport Security Coordinator - Training School Certificate

Students who complete either AES 3880 or CJC 405M, with a grade of C or higher, may receive the Airport Security Coordinator Certificate.* Request the certificate by presenting proof of passing the course to the AVS Program Coordinator (see front AVS front office for details). (*This is a department certificate and is not noted on official transcripts.)

Air Force ROTC

Detachment 105 is located on the CU Boulder campus where AFROTC classes are held each week during the academic year. We are the seventh largest (of 145) detachments nationwide and hosts the widest range of satellite schools to include Metropolitan State University of Denver. Please review the information provided at the following link http://www.colorado.edu/afrotc/ and contact Professor Kevin Kuhlmann for details – kuhlmank@msudenver.edu.

MSU Denver Women in Aviation (WAI)

We are MSU Denver's Collegiate Chapter of Women in Aviation International. A group of diverse, hardworking, and goal-oriented students, we strive for equality and encouragement within the aviation industry. Our participation as a group plays a small part in an otherwise global effort to provide a supportive community to men and women pursuing a career in aviation or aeronautics.

Volunteering, networking, and connecting with one another as well as future generations is a focal point of our purpose at MSU Denver. We recognize the importance of continuing education, collaborating with one another, and gaining the tools and skills to better secure career-oriented goals. Come soar with us!

Alpha Eta Rho

Alpha Eta Rho International Aviation Fraternity/Sorority is a professional collegiate organization founded to bring together those students having a common interest in the field of commercial aviation. Since 1929, the organization has fostered a unique bond among fellow aviators and aviation enthusiasts and has aspired to uphold our longstanding motto of "Collegiate Aviation Leaders of Today... Aviation Industry Leaders of Tomorrow." Alpha Eta Rho members take advantage of industry networking opportunities such as airport, airline, and charter company site visits, participate in social activities and build a network of with other aviation professionals.

Collegiate Training Initiatives (CTI)

MSU Denver's Aviation & Aerospace Science Department is an FAA-designated AT-CTI and UAS-CTI Program. The AT-CTI program serves as part of the FAA Collegiate Training Initiative, providing a foundation to a potential career as an FAA air traffic controller. AT-CTI graduates are not guaranteed employment with the FAA. FAA hiring requirements include:

1. **Holding U.S. citizenship;**
2. **Being less than 31 years of age upon application to the FAA;**
3. **A recommendation from an authorized AT-CTI school official;**
4. **Completion of all required concentration courses with a "B" (3.0 GPA or higher) average;**
5. **Pass AES 4100 with a B- or better;**
6. **Meeting FAA medical, security, and suitability requirements;**
7. **Able to speak English clearly enough to be understood over radios, intercoms, and similar communications equipment**

Please email Professor Kevin Kuhlmann at kuhlmank@msudenver.edu with any questions or requests regarding these requirements. Completing MSU Denver's AT-CTI Program or passing the AT-SAT test battery does not guarantee an employment offer from the FAA. For the courses required by the AT-CTI program see AT-CTI program requirements described in this document. All students seeking enrollment in the AT-CTI degree option must seek a mandatory advising session with Professor Kuhlmann – email for an appointment kuhlmank@msudenver.edu

The Unmanned Aircraft Systems Collegiate Training Initiative (UAS-CTI) was designed for the FAA to recognize institutions that prepare students for careers in unmanned aircraft systems. With the rapid growth of the Unmanned Aircraft Systems (UAS) industry, there is a need to ensure that new technology is safely integrated into the National Airspace System and that there is a pipeline of qualified professionals to meet the increasing demand. Please email Thomas Shriver at tshriver@msudenver.edu with any questions or requests regarding the UAS-CTI program.

Honors Program All Aviation and Aerospace Science students are encouraged to consider pursuing options within the Honors Program. The Metropolitan State University of Denver Honors Program is a community of highly motivated and academically adventurous students and faculty members dedicated to working together to attain new levels of achievement. This is an innovative program that allows students to achieve the Honors Program credential by completing an individually tailored combination of both academic courses and co-curricular honors options. The Honors Program is designed to develop in our students the ability to apply critical and creative thinking as well as conduct high-quality research and creative work. Honors students also learn to integrate a variety of disciplines in their approach to a given project, demonstrate civic and intercultural knowledge and engagement, and reflect critically upon their values and the learning process. Students who enroll in Honors should expect a challenge that stimulates curiosity and research while broadening perspectives in unexpected ways. For further information, please see https://www.msudenver.edu/honors-program/

*Smoke on at Morgan Adams Concours d'Elegance Aerial Demonstration, Centennial Airport, KAPA. (Image by **John Little**)*

Internship Program Aviation and aerospace internships are usually available each term. You may enroll for up to 12 semester hours of university credit in AES 3980 Internship in Aviation, 6 semester hours of which may apply as electives in your degree. Contact the Classroom to Career Hub 303-615-1333 or visit their website. For further questions regarding internships, please contact Dr. Forrest at forrestj@msudenver.edu . ***NOTE: Internships are rapidly becoming a standard for employment qualifications – all students are strongly encouraged to seek Internship opportunities!***

United Aviate

Aviate is the United Airlines' pilot career development program offering both aspiring flight students and commercial pilots a defined career path to United as a First Officer. United's goal is to attract outstanding people who want to join the very best team of pilots in the aviation industry. United understands that in order to do this, Aviate must be flexible enough to accommodate individuals at every stage of their training and development.

Through its network of participating universities, professional flight training organizations, Part 135 operators, and United Express carriers, United can offer Candidates multiple points of entry into Aviate. Candidates who apply and are selected to join Aviate will benefit from a career path that is tailored to their current experience level, enabling them to build flight hours and develop as leaders in preparation for a potential position with United as a First Officer. United's success depends upon its ability to attract and retain talented pilots to operate its aircraft and ensure that its passengers are delivered safely and reliably to the destinations served by United and United Express. At the same time, United understands that the costs associated with becoming a pilot are significant. Aviate is designed to ease some of the uncertainty faced by flight students and aspiring airline pilots by providing a path to potential employment with United, and clear direction on the qualifications and milestones that must be achieved to advance down this path.

University Entry Point. Candidates applying to Aviate through the University Entry Point must:

a. Be either (i) a current student at a participating university, pursuing an aviation degree that will result in eligibility for an R-ATP certificate and having completed at least two semesters of coursework (three semesters if on a trimester schedule), or (ii) a graduate of a participating university, holding an aviation degree that makes such graduate eligible for an R-ATP certificate.

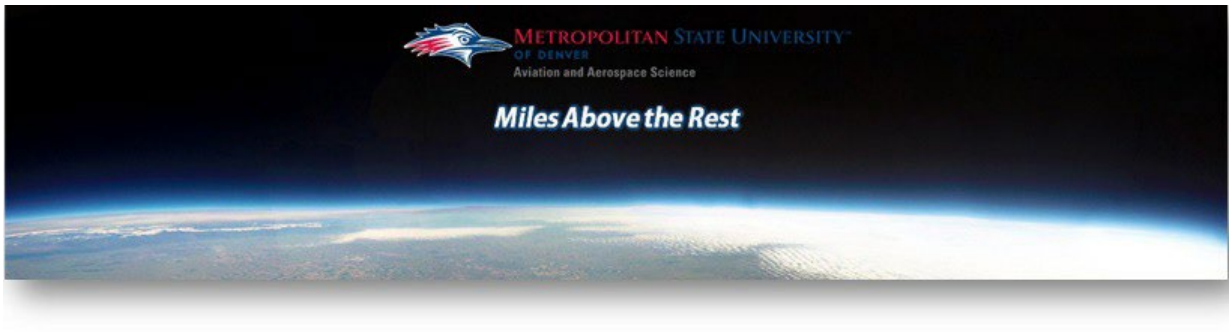
b. In the case of current students, be in good standing with their participating university.

c. Have no documented violations of their applicable university's student code of conduct (or equivalent policy), or have been the subject of any disciplinary actions; and

d. Have no more than three Primary Training Failures.

For further information, please visit: https://unitedaviate.com/

DEGREE PROGRAMS



DEGREE PROGRAMS OVERVIEW

Metropolitan State University of Denver's Aviation & Aerospace Science students have several program options leading to careers in aviation or aerospace (including the rapidly expanding commercial aerospace industry and unmanned aircraft vehicle industry).

Aviation & Aerospace Science (ASC) degree concentrations

- Aerospace Operations (ASC1) – aviation or aerospace operations management or logistics
- Professional Flight Officer (ASC2) – career airline or commercial flight officer
- Air Traffic Collegiate Training Initiative - AT-CTI (ASC3) – FAA Air Traffic Control careers

Aviation and Aerospace Management (AAM) degree concentration (requires any minor offered by the College of Business)

- Aviation and Aerospace Management (AAM) – airport management, airline management, safety/security management, commerce, entrepreneurship, graduate school preparation

Aerospace (IDP) programs and degree concentrations

- Aerospace Physics (IDP) space science, space exploration, physics, graduate school preparation
- Aerospace Systems Technology (AST) (IDP) aerospace systems technology, graduate school preparation
- Uncrewed Aerospace Systems (IDP), tracks: Advanced Manufacturing, Operations, Science, Digital Security.

ASC students may minor in Space Commercialization (IDP) or any other university minor program. Other degree seeking students (non-AVS) may minor in Aviation Management, Aviation Technology, and Space Commercialization (IDP).

Catalog – Selection for Requirements

All graduation requirements must follow the guidelines and requirements specified within a single MSU Denver Catalog edition (your declared academic year). You must use the catalog in effect when you first enrolled at MSU Denver, or a subsequent catalog year in effect while still enrolled as a student at MSU Denver, to meet your general studies, major, and minor requirements. If you are transferring from a regionally accredited Colorado community college, you may complete degree requirements using an MSU Denver Catalog in effect while enrolled at the community college, provided that the degree catalog selected does not predate the current MSU Denver catalog by more than 3 years. Consult a departmental advisor or a College of Professional Studies Academic Advisor (303-556-3304) for more information on previous catalog years and related specifics.

Note about AVS Electives

All notations to "AVS Electives" in this guide refer to any AVS course (AES prefix) other than AVS courses listed as a required part of your major/concentration.

Program Requirements for Each Major

Aviation & Aerospace Science Degree programs, including Individualized Degree Programs and the General Studies courses for AVS majors are listed on the following pages. With each program is a suggested sequence of courses for the eight semesters needed for the Bachelor of Science degree.

- ***A grade of at least C- is required in all upper division courses listed as part of the major, whether they are AES courses or other prefix courses, including electives. This requirement does not apply to the minor or to General Studies.***
- ***Students must complete each course used in an AVS certificate program with a grade of "C" or better.***

General Studies Recommendations

Students seeking a Bachelor of Science degree through the Aviation & Aerospace Science Department at MSU Denver must complete the General Studies Requirements as listed in the appropriate University catalog. Note: Any approved General Studies course for each related category can be used to fulfill (a) Written Communication, (b) Oral Communication, and (c) Quantitative Literacy. The first 3 credits of the required 6 credits for Written Communication must be completed within the first 30-credits at MSU Denver. The remaining 3-credits of Written Communication must be completed within 45-credits.

Written Communication (6 credit hours)

Recommended:

- **ENG 1009 – Introduction to Composition, Part 2 OR ENG 1010 – Composing Arguments**

Recommended:

- **ENG 1020 – Freshman Composition: Analysis, Research, and Documentation OR ENG 1021 – Honors Freshman Composition: Analysis, Research, and Documentation**

Oral Communication (3 credit hours)

Recommended:

- **CAS 1010 – Public Speaking OR CAS 1710 – Interpersonal Communication**

Quantitative Literacy (4 credit hours)

Highly recommended courses:

- **ASC: MTH 1108 & 1109 – College Algebra Stretch I & II OR MTH 1110 - College Algebra for Calculus OR MTH 1111 & 1101 – College Algebra for Calculus + Lab OR MTH 1112 - College Algebra Through Modeling OR MTH 1115 & 1116 College Algebra Through Modeling + Lab OR MTH 1310 - Finite Mathematics for the Management and Social Sciences OR MTH 1311 & 1312 Finite Mathematics for the Management and Social Sciences + Lab OR MTH 1210 – Introduction to Statistics**
- **AAM: MTH 1080 - Mathematics for Liberal Arts OR MTH 1081 & MTH 1082 - Mathematics for Liberal Arts + Lab OR MTH 1310 – Finite Mathematics for the Management and Social Sciences OR MTH 1311 & 1312 – Finite Mathematics for the Management and Social Sciences + Lab OR MTH 1210 – Introduction to Statistics**

Arts and Humanities (6 credit hours)

Recommended:

- **PHI 1030 - Introduction to Ethics (ASC Majors only) OR PHI 3360 - Business Ethics (AAM Majors only) - AND any approved General Studies Arts and Humanities course**

Historical (3 credit hours)

- **Any approved General Studies Historical course**

Natural and Physical Sciences (6 credit hours)

- **Any approved General Studies Natural and Physical Sciences course**

  Note: Some biology and chemistry courses require both a lecture and a laboratory to satisfy general studies requirements. Please see course notes for corequisite requirements.

Social and Behavioral Sciences I (3 credit hours)

- **Any approved General Studies Social and Behavioral Science I course**

Social and Behavioral Sciences II (3 credit hours)

- **Any approved General Studies Social and Behavioral Science II course**

Note: Students may satisfy the Global Diversity General Studies and Multicultural graduation requirements by completing any course designated as Global Diversity or Multicultural within one of the Arts and Humanities, Historical, or Social and Behavioral Sciences General Studies course categories. To complete the General Studies Program, students must take approved courses that fulfill the following distribution and credit requirements:

CATEGORY (credits): **Written Communication (6); Oral Communication (3); Quantitative Literacy (4); Arts & Humanities (6); Historical (3); Natural & Physical Sciences (6); Social & Behavioral Sciences I (3); Social & Behavioral Sciences II (3); Global Diversity (0-3)*** -- TOTAL: 33-36

*The Global Diversity requirement may be fulfilled by taking an approved course within one of the following categories: Arts and Humanities; Historical; Natural and Physical Sciences; Social and Behavioral Sciences I; or Social and Behavioral Sciences II. The following course categories must be completed within the first 30 college-level credits (including credits completed at MSU Denver and those transferred from other institutions): Written Communication (first 3 credits of coursework); Oral Communication (3 credits of coursework); Quantitative Literacy (3 credits of coursework).

The following course category must be completed within the first 45 college-level credits (including credits completed at MSU Denver and those transferred from other institutions): **Written Communication (remaining 3 credits of coursework)**

The following course categories must be completed within the first 90 college-level credits (including credits completed at MSU Denver and those transferred from other institutions): **Arts & Humanities (6); Historical (3); Natural & Physical Sciences (6); Social & Behavioral Sciences I (3); Social & Behavioral Sciences II (3); Global Diversity** (one course designated "global" from any category will fulfill both the global diversity requirement and the appropriate credits in that category). The Multicultural requirement is a graduation requirement. A course that fulfills the Multicultural requirement may also fulfill a General Studies requirement OR a major requirement OR a minor requirement OR it may be used in free electives.

Aerospace Operations (ASC1)

B.S. Aviation & Aerospace Science (ASC) Designed for those seeking career opportunities in aviation or aerospace operations, systems integration, or logistical planning. This degree supports careers that integrate commercial venues of aerospace with aviation.

REQUIRED CORE (ASC1)

AES 1040 - Introduction to Unmanned Aircraft Systems (3) - **or**- AES 1050 - Introduction to Space (3)
AES 1100 - Aviation Fundamentals (4)
AES 1400 - Aviation Weather (3)
AES 1710 - Instrument Flight Simulation I (3)
AES 2050 - Aviation Hist & Aero Develop (3)
AES 2200 - Fundamentals of Air Traffic Control (4)
AES 2220 - Flight Dispatcher & Load Planning (3)
AES 2607 - Intro to Aerospace Syst. Sim (3)
AES 2630 - Spacecraft Mission Operations I (3)
AES 3600 - Space Flight Operations I (3)
AES 3850 - Human Factors & Physiology of Flight (3)
AES 3880 - Aviation Security (3)
AES 4200 - Airport Planning & Management I (3)
AES 4601 - Space Flight Operations II (3)
AES 4602 - Aerospace Commercialized Operations (3) **-or-** AES 4210 - Airport Planning & Management II (3)
AES 3620 - Aerospace Syst. Prj/ & Miss. Sched. (3) **-or-** AES 3630 - Spacecraft Mission Ops II (3) **-or-** AES 4603 - Aerospace Ops Sys Anal & Design (3)
AES 4860 - Aviation Safety **-or**- AES 4870 - Aviation Safety Program Management (3)
AES 4910 - Aviation & Aerospace Strat. Plan. (Sr. Exp.) (3)
JMP 2610 - Introduction to Technical Writing **-or-** BUS 1950 - Business Communication (3)
AES 4930 - Professional Flight Standards Seminar (Sr. Exp.) **-or**- JMP 4790 - Senior Seminar in Technical Communication (Sr. Exp.) (3

Core Subtotal: 62 credit hours

REQUIREMENTS SUMMARY:
Major Core (**62**) + General Studies (**33 minimum**) + Minor or Unrestricted Electives (**25**) = Aerospace Operations Total: **120** credit hours. Total program hours must equal at least **120** credit hours. Be sure to plan all your electives or minor accordingly. (ASC1 students may still seek a minor, although by doing so, student will exceed the required **120** credit hours required for this degree.) *Students are free to take any approved Quantitative Literacy GS course, however the MTH courses listed are highly recommended.

Degree Plan for Aerospace Operations (ASC1)

Semester 1
AES 1100 - Aviation Fundamentals
AES 1400 – Aviation Weather
Written Comms I GS
MTH1108&1109 – College Algebra Stretch **-or**- MTH 1110 - College Algebra **-or**- MTH 1112 - College Algebra thru Modeling **-or**- MTH 1310 - Finite Math - Mgmt & Soc Scncs -or- MTH 1210 Intro to Stats*
Total: 15 - 16 Sem. Hrs.

Semester 2
AES 2220 – Flight Dispatcher & Load Planning
AES 1040 - Intro to Unmanned Aircraft Systems -or- AES 1050 - Introduction to Space
Oral Communications GS
Written Comms II GS
Nat. & Phy. Science GS
Total: 15 Sem. Hrs.

Semester 3
AES 2630 – Spacecraft Mission Operations I
AES 2050 - Aviation Hist & Aero Develop
Arts & Humanities GS (MC or GD)
Nat. & Phy. Science GS
Soc. & Beh. I GS
Total: 15 Sem. Hrs.

Semester 4
AES 1050 - Introduction to Space
AES 2200 - Fundamentals of Air Traffic Control
AES 2607 - Intro to Aerospace Systems Simulation
History (GS approved elective)
Soc. & Beh. II GS (MC or GD if needed)
Total: 16 Sem. Hrs.

Semester 5
AES 3000 - Aircraft Systems & Propulsion
AES 3600 - Space Flight Operations I
AES 3880 - Aviation Security
JMP 2610 or BUS 1950
Unrestricted Elective
Total: 15 Sem. Hrs.

Semester 6
AES 3850 - Human Factors & Physiology of Flight
AES 4601 - Space Flight Operations II
Arts & Humanities (GS approved elective)
AES 3610 Elem. Of Spcrft Design I - **or** - AES 3607 Orbital Mech & Aero Sys Sim
Unrestricted Elective (recommend 4 credits)
Total: 16 Sem. Hrs.

Semester 7
AES 4200 - Airport Planning & Management I
AES 4603 - Aero Ops Sys Analysis & Design - **or** - AES 3620 Aero Sys Proj & Mission Sched
AES 4860 - Aviation Safety -or- AES 4870 - Aviation Safety Program Management
Unrestricted Elective (recommend 4 credits)
Unrestricted Elective
Total: 15 Sem. Hrs.

Semester 8
AES 4602 - Aerospace Commercialized Operations - **or** - AES 4620 Elem. Of Spcrft Design II
AES 4910 - Av & Aero Str Planning (Sr. Exp.)
AES 4930 - Professional Flight Standards Seminar -or- AES 4210 Airport Planning & Management II -or- JMP 4790 - Sr Sem in Tech Comm.
Unrestricted Elective
Total: 15 Sem. Hrs

Professional Flight Officer (ASC2)

B.S. Aviation & Aerospace Science (ASC)

This concentration is designed for those planning a career as a professional pilot and requires flight training be conducted in conjunction with the degree program. A student choosing this concentration must receive an **FAA Commercial Pilot single-engine certificate with an Instrument Rating and either a multi-engine land rating OR FAA Flight Instructor certificate (CFI) OR the FAA Advanced Ground Instructor (AGI) and Instrument Ground Instructor (IGI) certificates before graduation.** Before enrolling in this concentration, ensure that you can obtain the appropriate FAA medical certificate. For a list of FAA medical examiners, see http://www.faa.gov/pilots/amelocator/ . **Students may receive transfer credit for applicable pilot ground, simulator, and flight lab courses for FAA certificates and ratings earned within 30 days of the commencing ASC2 program. For questions, please contact either Prof. Chad Kendall (ckendal4@msudenver.edu) or Prof. Kevin Kuhlmann (kuhlmank@msudenver.edu).**

REQUIRED CORE (ASC2)

AES 1040 - Intro to Unmanned Aircraft Sys (3) -**or-**
AES 2050 – Aviation Hist & Aero Develop (3)
AES 1100 - Aviation Fundamentals (4)
AES 1400 - Aviation Weather (3)
AES 1500 - Private Pilot Flight Lab (2)
AES 1710 - Inst Flight Simulation I (3**)**
AES 2120 - Instrument Fundamentals (4)
AES 2130 - Comm Flight Operations (3)
AES 2200 - Fundamentals of Air Traffic Control (4)
AES 2220 - Flight Dispatcher & Load Planning (3)
AES 2500 - Instrument Pilot Flight Lab (2)
AES 2710 - Instrument Flight Simulation II (3)
AES 3000 - Aircraft Systems & Propulsion (3)
AES 3520 - Comm Single-Engine Flight Lab (2)
AES 3530 - Aerodynamics (3)
AES 3650 - Advanced Flight Technologies (3)
AES 3710 - Multiengine Flight Sim I (3)
AES 3850 - Human Factors & Physiology of Flight (3)
AES 3880 - Aviation Security (3)
AES 4040 - Aircraft Performance (3)
AES 4370 - Advanced Navigation Systems (3)
AES 4500 - Comm Multi-Engine Flt Lab (2)
-or- AES 4510 - Flight Instructor Flight Lab (2)
AES 4540 - FAA Instructor Ground School (3)
AES 4710 - Turboprop Flight Simulation (4)
-or- AES 4935 - Advanced Commercial Aircraft Systems (4)
AES 4860 - Aviation Safety (3)
AES 4910 - Aviation & Aerospace Strat. Planning (Sr. Exp.) (3)
AES 4930 - Professional Flight Standards Sem. (Sr. Exp.) (3)

Core Subtotal: 78 credit hours

REQUIREMENTS SUMMARY:
Professional FAA Pilot Documentation (**0**) + Major Core (**78**) + General Studies for AVS majors (**33-34**) + Unrestricted Electives* (**8**). Professional Flight Officer Total: must equal at least **120** credit hours. Be sure to plan all of your electives accordingly. (*ASC2 students may still seek a minor, although by doing so, student will exceed the required **120** credit hours required for this degree.) *Students are free to take any approved Quantitative Literacy GS course, however the MTH courses listed are highly recommended.

Degree Plan for Professional Flight Officer (ASC2)

Semester 1
AES 1100 - Aviation Fundamentals
AES 1500 - Private Pilot Flight Lab
AES 1400 - Aviation Weather
Written Communication GS
Quantitative Literacy (4) Algebra-based math course
Total: 15 Sem. Hrs.

Semester 2
AES 1710 - Instrument Flight Simulation I
Oral Communications GS
Written Comms II GS
Nat. & Phy. Science GS
Arts and Humanities GS
Total: 15 Sem. Hrs.

Semester 3
AES 2120 - Instrument Fundamentals
AES 2500 – Instrument Pilot Flight Lab
AES 1040 - Intro to UAS -or- AES 2050 Aviation & Aerospace History & Development
AES 2220 – Flight Dispatcher & Load Planning
Nat. & Phy. Science GS
Total: 15 Sem. Hrs.

Semester 4
AES 2710 – Instrument Flight Simulation II
AES 2200 – Fundamentals of Air Traffic Control
AES 3650 - Advanced Flight Technologies
Historical GS (ESSJ or GD)
Soc. & Beh. Science GS (ESSJ or GD if needed)
Total: 16 Sem. Hrs.

Semester 5
AES 2130 – Commercial Flight Operations
AES 3520 – Commercial Single-Engine Flight Lab
AES 3000 – Aircraft Systems and Propulsion
AES 3530 – Aerodynamics
Soc. & Behavioral Science II GS
Total: 14 Sem. Hrs.

Semester 6
AES 3710 – Multi-Engine Flight Simulation
AES 3880 – Aviation Security
AES 4040 – Aircraft Performance
AES 4370 – Advanced Aircraft Systems
Arts and Humanities GS
Total: 15 Sem. Hrs.

Semester 7
AES 4540 – FAA Instructor Certification – Ground
AES 4500 – Commercial Multi-Engine Flight Lab -or-
AES 4510 – Flight Instructor Flight Lab
AES 4935 – Advanced Commercial Aircraft Systems
General Elective
Total: 15 Sem. Hrs.

Semester 8
AES 4860 - Aviation Safety
AES 4910 – Aviation & Aerospace Strategic Planning
AES 4930 – Professional Flight Standards (Capstone)
General Elective
General Elective
Total: 15 Sem. Hrs

Professional Flight Officer
Flight, Ground, and Simulator Course Sequencing and Helpful Information

Before beginning our flight training program
1) Watch our advising videos on YouTube (MSU Denver Aviation & Aerospace Science)
2) Meet with an Aviation Advisor (select flight training provider & discuss aviation classes)
3) Declare Professional Flight Officer Concentration
4) Obtain FAA Medical Certificate – recommend 1st class medical (Find an Aviation Medical Examiner) (There are associated costs).

	Ground Course	**Flight Course**	**Simulator Course**
Semester 1	AES 1100 Aviation Fundamentals	AES 1500 Private Flight Lab	
Semester 2			AES 1710 Instrument Sim I
Semester 3	AES 2120 Instrument Fundamentals	AES 2500 Instrument Flight Lab	AES 2710 Instrument Sim II
Semester 4	AES 2130 Commercial Flight Operations	AES 3520 Commercial Single-Engine Flight Lab	
Semester 5	AES 4540 CFI Ground	AES 4500 (Commercial Multi-engine) OR 4510 (Flight Instructor) OR AGI & IGI	AES 3710 Multi-Engine Sim

Notes:
1) Optional financial assistance to fund flight training is available through our flight courses
2) Flight students need to work with their flight training provider for Transportation Security Administration (TSA) Citizenship Verification or Flight Training Security Program (FTSP) as soon as possible before beginning flight training
3) Ground course and Flight course must be done concurrently (exceptions made for private pilot training)
4) Student class scheduling may vary based on transfer credit, pace of flight training, etc. It's important to meet with an aviation advisor to discuss an individualized plan.
5) Other elective flight courses are available (CFI-I, MEI, Helicopter, ATP, FE & Type Rating).

MSU Denver Restricted-Airline Transport Pilot (R-ATP) Authorization

MSU Denver Aviation & Aerospace is excited to announce that it has received approval from the FAA to authorize eligible students for reduced time towards the Restricted-ATP; reducing the total flight time required to enter Part 121 operations in the United States from 1500 hours to 1000 hours.

Fall 2023 list of MSU Denver FAA Approved 141 Flight Training Providers (updated 8/1/2023):

1) Air Force Academy Aero Club – USAF Academy Airfield (KAFF) Colorado Springs, Colorado / Private and Instrument 141 Training Only** **Must be member eligible**

2) Direct Connect Flight Academy – Colorado Springs Airport (KCOS) Colorado Springs, Colorado

3) McAir Aviation – Rocky Mountain Metropolitan Airport (KBJC) Broomfield, Colorado

4) Peterson Airforce Base – Rocky Mountain USAF Flight Training Center (Peterson ASB Aero Club) – Colorado Springs Airport (KCOS) Colorado Springs, Colorado

5) Western Air Flight Academy – Rocky Mountain Metropolitan Airport (KBJC) Broomfield, Colorado

6) Western Air Flight Academy – Colorado Air and Space Port (KCFO) Watkins, Colorado

RTP Authorization Frequently Asked Questions

1) What makes me eligible for the R-ATP Authorization?

MSU Students are eligible for the R-ATP authorization on the following conditions:

- Complete Instrument Fundamentals (AES 2120) and Commercial Flight Operations (AES 2130) **GROUND** courses under MSU Denver's FAA Part 141 certificate OR transferred to MSU Denver from another R- ATP authorized institution of higher education with 141 instrument and commercial ground courses.
- Complete at minimum, Instrument and Commercial **FLIGHT** training at one of our approved FAA 141 flight training providers. Students must register for AES 2500 (Instrument Pilot Flight Lab) and AES 3520 (Commercial Single-Engine Flight Lab) during that respective flight training and have those courses on their official MSU Denver transcript prior to graduating and receiving R-ATP approval. Students may have flight courses transferred from another R-ATP authorized institution of higher education with 141 instrument and commercial flight courses.
- Ground and Flight Training, especially instrument and commercial single-engine must be done concurrently.
- For a 500-hr. reduction - complete 60 or more FAA approved course credit hours from the MSU Denver Aviation & Aerospace B.S. Aviation & Aerospace Science degree program (Please reach out to MSU Denver Aviation & Aerospace for a current list of approved courses).
- For a 250-hr. reduction - complete 30-59 FAA approved course credit hours from the MSU Denver Aviation & Aerospace B.S. Aviation & Aerospace Science degree program (Please reach out to MSU Denver Aviation & Aerospace for a current list of approved courses).
- Complete the Bachelor of Science Aviation & Aerospace Science (Professional Flight Officer Concentration) and have the degree conferred AT OR AFTER Fall 2021.

2) Am I eligible if I graduated before Fall 2021?

Unfortunately, students who had their degree conferred prior to Fall 2021 will not be eligible for R- ATP authorization from MSU Denver.

3) What if I did not do the Pro-Flight Concentration, am I still eligible?

The FAA approved MSU Denver to authorize only those students who complete the Professional Flight Officer Concentration.

4) Do I have to do flight training at one of the approved 141 Flight Training providers?

Only to receive R-ATP authorization and at minimum, the Instrument Rating and Commercial Single- Engine Certificate must be done at an MSU Denver approved FAA 141 flight training provider. The Private Pilot Certificate and Commercial Multi Add-on OR CFI can be done anywhere, including those locations. Students can complete their flight training requirements under the degree program at any location,
but only at an approved flight training provider will they be eligible for R-ATP authorization.

5) If I do not want to get the R-ATP authorization, do I need to do anything different?

R-ATP authorization reduces the First Officer (Second-In-Command) total flight time requirements for FAA Part 121 operations in the United States. Receiving the authorization is not required as part of the MSU Denver Aviation & Aerospace Science degree program.

6) What if I completed all the requirements except, I did not get 60 or more credit hours?

MSU Denver can authorize students who have met all the requirements and did not receive 60 or more credit hours. Students who complete 30-59 approved credit hours will be authorized for R-ATP at 1250 hours NOT 1000 hours.

7) If I transferred here from another authorized two-year program, what will I need to do to receive R-ATP authorization from MSU Denver?

If you transferred to MSU Denver from another authorized R-ATP institution of higher education and completed 141 instrument and commercial ground and flight training at that program, then you only need to reach the 60 or more credit hours at MSU Denver and complete the Bachelor of Science Aviation & Aerospace Science (Professional Flight Officer Concentration) to be authorized for 1000 hours.

8) What if I have not graduated but already completed my instrument rating Part 61 or Part 141 at another flight school?

Unfortunately, students who have completed certificates and ratings beyond the Private Pilot certificate, except those students who transferred in from another authorized R- ATP institution of higher education will not be eligible for the R-ATP authorization.
Please contact Prof. Kendall at 303-605-7224 or ckendal4@msudenver.edu if you have any questions.

Air Traffic Collegiate Training Initiative (FAA AT-CTI) (ASC3)

Major: B.S. Aviation & Aerospace Science (ASC)

The Air Traffic Collegiate Training Initiative concentration (ASC3), also known as the AT-CTI program, has been designed through a partnership with the Federal Aviation Administration (FAA) in order to provide a foundation for students interested in becoming FAA air traffic control specialists. MSU Denver is one of only 36 higher education institutions across the country designated by the FAA as part of its Collegiate Training Initiative and is an FAA-approved AT-CTI program. Weather, airspace, teamwork in aviation, navigation, and search and rescue are among the fundamentals covered in this course of study. For more information on the AT-CTI concentration contact Professor K. Kuhlmann kuhlmank@msudenver.edu.

Required Core (ASC3)

AES 1100 - Aviation Fundamentals (4)
AES 1400 - Aviation Weather (3)
AES 1710 - Instrument Flight Simulation I (3)
AES 2120 - Instrument Fundamentals (4)
AES 2130 - Commercial Flight Operations (3)
AES 2200 - Fundamentals of Air Traffic Control (4)
AES 2710 - Instrument Flight Simulation II (3)
AES 3880 - Aviation Security (3)
AES 4100 - Advanced Air Traffic Control (3)
AES 4370 - Advanced Navigation Systems (3)
AES 4860 - Aviation Safety (3) **-or-** AES 4870 - Aviation Safety Program Management (3)
AES 4910 - Aviation & Aerospace Strategic Planning (Sr. Exp.) (3)
AES 4930 - Professional Flight Standards Seminar (Sr. Exp.) **-or-** AES 4210 - Airport Planning & Management II* (Sr. Exp.) **-or-** JMP 4790 - Senior Seminar in Technical Communication (Sr. Exp.) (3)
(*Requires completion of AES 4200 - Airport Planning and Management I)

Core Subtotal: 42 credit hours

REQUIREMENTS SUMMARY:
Major Core (**42**) + AES Electives (**27**) + Minor or additional Unrestricted Electives (**18-21**) AVS General Studies (**33-34**) = Air Traffic Collegiate Training Initiative Total: **120** credit hours. Total program hours must equal at least **120** credit hours. Be sure to plan all of your electives or minor accordingly. *Students are free to take any approved Quantitative Literacy GS course, however the MTH courses listed are highly recommended.

Note: See your advisor for suggestions on selecting a non-AVS minor or Unrestricted Electives for this major. Actual number of elective credits necessary will vary based on individual program specifics.

Degree Plan for AT-CTI Air Traffic Collegiate Training Initiative (ASC3)

Semester 1
AES 1100 - Aviation Fundamentals
AES 1400 - Aviation Weather
Written Comms I GS
MTH1108&1109 – College Algebra Stretch **-or-** MTH 1110 - College Algebra **-or-** MTH 1112 - College Algebra thru Modeling **-or-** MTH 1310 - Finite Math - Mgmt & Soc Scncs -or- MTH 1210 Intro to Stats*
Total: 16 Sem. Hrs.

Semester 2
AES 1710 - Instrument Flight Simulation
Oral Communications GS
Written Comms II GS
Nat. & Phy. Science GS
Arts & Humanities GS
Total: 15 Sem. Hrs.

Semester 3
AES 2120 - Instrument Fundamentals
AES 2200 - Fundamentals of Air Traffic Control
Nat. & Phy. Science GS
Soc. & Beh. I GS (MC or GD)
Total: 14 Sem. Hrs.

Semester 4
AES 2130 - Commercial Flight Operations
AES 2710 - Instrument Flight Simulation II
AES Elective
AES Elective
Soc. & Beh. II GS (MC or GD)
Total: 15 Sem. Hrs.

Semester 5
AES 3880 - Aviation Security
AES Elective
AES Elective
AES Elective
History GS (MC or GD if needed)
Total: 15 Sem. Hrs.

Semester 6
AES 4370 - Advanced Navigation
AES Elective
AES Elective
Arts & Humanities GS (MC or GD if needed)
Total: 15 Sem. Hrs.

Semester 7
AES 4860 - Aviation Safety -or- AES 4870 - Aviation Safety Program Management
AES 4910 - Aviation & Aerospace Str Planning (Sr. Exp.)
Unrestricted Elective or Minor
Unrestricted Elective or Minor
Unrestricted Elective or Minor
Total: 15 Sem. Hrs.

Semester 8
AES 4100 - Advanced Air Traffic Control
AES 4930 - Professional Flight Standards Seminar -or- AES 4210 - Airport Planning & Mgmt. II -or- JMP 4790 - Senior Seminar in Technical Comm.
Unrestrictive Elective or Minor
Unrestricted Elective or Minor
Unrestricted Elective or Minor
Total: 15 Sem. Hrs.

B.S. AVIATION AND AEROSPACE MANAGEMENT (AAM)

Major: B.S. Aviation & Aerospace Science (AAM) The AAM program is designed for those seeking career opportunities in airport management, airline management, corporate aviation, or general aviation. This degree also supports careers that integrate business venues of aerospace and space commercialization with many areas of management in aeronautics.

NOTE: Students that complete requirements for the AAM degree also fulfill requirements for the Airport Management Certificate. Students must declare the certificate and submit an additional graduation application to receive the certificate.

REQUIRED CORE (AAM)

AES 1040 – Introduction to Unmanned A/C Syst. (3) **-or-**
AES 1050 - Introduction to Space (3)
AES 1100 - Aviation Fundamentals (4)
AES 1400 - Aviation Weather (3)
AES 2050 – Aviation Hist & Aero Develop (3) **-or-**
AES 2607 - Intro to Aerospace Syst. Sim (3)
AES 2220 - Flight Dispatcher & Load Planning
AES 3220 - Aviation Law & Risk Management (3)
AES 3230 - Airline Management (3)
AES 3240 - Airline Planning (3)
AES 3600 - Space Flight Operations I (3)
AES 3850 - Human Factors & Physiology of Flight (3)
AES 3880 - Aviation Security (3)
AES 4200 - Airport Planning & Management I (3)
AES 4210 - Airport Planning & Mgt. II (Sr. Exp.) (3)
AES 4230 - General & Business Aviation Ops. (3)
AES 4240 - Air Cargo Industry (3)
AES 4601 - Space Flight Operations II (3)
AES 4602 - Aerospace Commercialized Operations (3)
AES 4603 - Aerospace Ops. Syst. Anal. & Design (3) **-or-**
AES 3620 - Aeros Syst. Prj. & Miss. Sched. (3)
AES 4870 - Aviation Safety Program Management (3)
AES 4910 - Aviation & Aerospace Strat. Plan. (Sr. Exp.) (3)

Core Subtotal: 61 credit hours

REQUIREMENTS SUMMARY:
Major Core (**61**) + Minor selected from the College of Business offerings (**18-24**) + General Studies (**33-34**) + Unrestricted Electives **(7)** = Aviation and Aerospace Management Total: **120-126** credit hours. Total program hours must equal at least **120** credit hours. Be sure to plan all your electives accordingly. (*AAM students may still seek an additional minor, although by doing so, student will exceed the required **120** credit hours required for this degree.)

Degree Plan for Aviation and Aerospace Management (AAM)

Semester 1
AES 1100 - Aviation Fundamentals
ENG 1010 - Composing Arguments
MTH 1080 – Math for Liberal Arts **-or-** MTH 1310 - Finite Math – Mgmt. & Soc. Scncs.**-or-** MTH 1210 – Intro to Stats
CAS 1010 - Public Speaking
Total: 16 Sem. Hrs.

Semester 2
AES 1400 - Aviation Weather
ENG 1020 or 1021 - Fresh. Comp. or Honors
AES 1040 - Intro to Unmanned Aircraft Systems or AES 1050 - Introduction to Space
Natural & Physical Sciences GS (6 SH)
Total: 15 Sem. Hrs.

Semester 3
AES 2220 - Flight Dispatcher & Load Planning
AES 2050 - Aviation Hist & Aero Develop or AES 2607 - Intro to Aerospace Systems Simulation
Soc. & Beh. I GS (GS approved elective; MC or GD)*
History GS (GS approved elective; MC or GD if needed)*
Arts & Humanities (GS approved elective MC or GD if needed)*
Total: 15 Sem. Hrs.

Semester 4
PHI 3360 - Business Ethics
Soc. & Beh. II (GS approved elective)*
Unrestricted Elective
Unrestricted Elective
Business Minor
Total: 15 Sem. Hrs.

Semester 5
AES 3220 - Aviation Law & Risk Management
AES 3230 - Airline Management
AES 3600 - Space Flight Operations I
AES 3880 - Aviation Security
Business Minor
Total: 15 Sem. Hrs.

Semester 6
AES 3240 - Airline Planning
AES 3850 - Human Factors & Physiology of Flight
AES 4240 - Air Cargo Industry
AES 4601 - Space Flight Operations II
Business Minor
Total: 15 Sem. Hrs.

Semester 7
AES 4200 - Airport Planning & Management I
AES 4603 - Aerospace Ops Sys Analysis & Design or AES 3620 - Aerospace Systems Prj. & Miss. Sched.
AES 4870 - Aviation Safety Program Management
AES 4910 - Aviation & Aerospace Str Planning (Sr. Exp.)
Business Minor
Total: 15 Sem. Hrs.

Semester 8
AES 4210 - Airport Planning & Management II
AES 4230 - General & Business Aviation Operations
AES 4602 - Aerospace Commercialized Operations
Business Minor
Business Minor
Total: 15 Sem. Hrs.

(*Global Diversity and/or Multicultural as needed; GS = general studies)

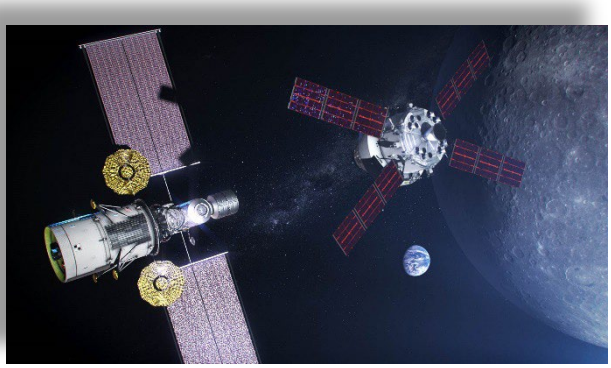
Advanced Manufacturing

The primary contact for this degree is Mark Yoss (myoss@msudenver.edu).

Courses	Credits		Notes
General Studies/AMS Required Prerequisites	34		General Studies Catalog
AMS Core Courses	34		AMS Academic Catalog
Professional Internship	3		Classroom to Career Hub
Concentration Courses	24		AMS Academic Catalog
Advisor Approved Electives	25		AMS Academic Catalog
General Studies/AMS Required Prerequisites			
Historical (Multicultural or Global Diversity)	3		
Art and Humanities (Multicultural or Global Diversity)	3		
Oral Communication	3		
ENG 1010 - Composing Arguments	3		
MTH 1109 - College Algebra Stretch, Part II ***OR*** **MTH 1110** - College Algebra for Calculus	4		
PHI 1030 - Introduction to Ethics (Recommended)	3		
ENG 1020 - Research and Argument Writing	3		
PHY 1020 - Physics of Advanced Materials (Recommended)	1		
PHY 2010 - College Physics I	4		
PHY 2030 - College Physics Laboratory	1		
ECO 2020 - Principles of Microeconomics (Recommended)	3		
CET 3120 - Engineering Economy	3		
AMS Core Courses			
AMS 1010 - Survey of Advanced Manufacturing & Workplace Prep	3		
AMS 3010 - Additive Manufacturing Stratasys Cert Prep	3		**Prerequisite(s):** IND 1450 or CET 1215 or MET 1200 with a grade of "C" or better, or permission of instructor
MET 1010 - Manufacturing Processes (Recommended) ***OR*** **IND 2830** - Manufacturing Materials and Processes	3		
MTH 1120 - College Trigonometry	3		
EET 1001 - Electronics: An Introduction	3		**Prerequisite(s):** High school algebra
MET 1200 - Technical Drawing I (Recommended) ***OR*** **IND 1450** - Technical Drawing and CAD ***OR*** **CET 1215** - Engineering Graphics	3		
JMP 2610 - Introduction to Technical Writing	3		
MET 1310 - Principles of Quality Assurance	3		**Prerequisite(s):** Intermediate algebra or equivalent with a grade of "C" or better
MET 2010 - CNC Machining and Inspection	3		
MET 3000 - Manufacturing Analysis	4		
CSS 1751 - Computing and Security for Manufacturing	3		**Prerequisite(s):** CIS/CSS 1010 with a grade of "C" or better; or appropriate score on the computer literacy screening test.
AMS 4950 - Professional Internship	3		
Aerospace Concentration Courses			
AES 1050 - Introduction to Space	3		
AES 2607 - Introduction to Aerospace Systems Simulation	3		
AES 3600 - Space Flight Operations I	3		**Prerequisite(s):** At least junior standing or Permission of instructor
AES 3607 - Orbital Mechanics and Aerospace Systems Simulations ***OR*** **AES 3610** - Elements of Spacecraft Design I	3		
AES 4601 - Space Flight Operations II	3		
AES 4602 - Aerospace Commercialized Operations ***OR*** **AES 3530** - Aerodynamics ***OR*** **AES 3620** - Aerospace Systems Project and Mission Scheduling	3		
AES 4603 - Aerospace Operations Systems Analysis and Design	3		
AES 4610 - Aerodynamic Design ***OR*** **AES 4620** - Elements of Spacecraft Design II	3		
AES 2630 – Spacecraft Mission Operations I	3		**Prerequisite(s):** AES 1050
AES 3630 – Spacecraft Mission Operations II	3		**Prerequisite(s):** AES 2630 and Junior Standing
AMS Advisor Approved Electives **19 credits with a minimum of 6 upper-division credits; see AMS Elective Courses at AMS Academic Catalog**			
TOTAL PROGRAM HOURS	**120**		

INDIVIDUALIZED DEGREE PROGRAMS (IDP)

The Individualized Degree Program (IDP) offers you the opportunity to seek unique degree programs that combine coursework from a variety of disciplines. The following IDP degree programs are routinely offered – other options are available as well:



B.S. Aerospace Systems Technology (AST)

B.S. Aerospace Physics

B.S. Uncrewed Aerospace Systems

Minor in Space Commercialization

Attend an information session. Information sessions are held on a regular basis throughout the year and are structured to give you the basic information needed to begin developing your degree proposal. A schedule of sessions is available from the Center for Individualized Learning, located in Administrative Building, room 360 (third floor). This schedule is also posted on their website at https://www.msudenver.edu/cil/, or you may contact the Center directly at 303-615-0525.

Meet with an advisor in the Center for Individualized Learning to discuss your proposal. Bringing a tentative list of courses you wish to consider for your program or emailing it to the advisor in advance of your scheduled appointment will make the session more useful to you. An unofficial transcript is also helpful. Advising appointments may be scheduled by calling the Center at 303-615-0525.

Develop your degree plan in consultation with your Center Advisor and a Faculty Mentor. Visit www.msudenver.edu/cil/ for further details about Individualized Degree Programs. For related AVS advising and specific questions about aerospace and aviation IDPs, contact Dr. Jeffrey Forrest at forrestj@msudenver.edu

B.S. AEROSPACE SYSTEMS TECHNOLOGY (AST) Individualized Degree Program (IDP)

The global demand for professionals qualified for careers in the space industry is very robust. Colorado leads the U.S. in dollars spent per capita in aerospace industry and the overall number of business entities providing for-profit services and manufacturing in the U.S. space economy. These companies frequently seek personnel that are responsible for the systems definition and design, systems planning, mission/flight operations, and overall business operations of space-based resources. Professionals working in this career track hold titles such as space/flight operations manager, space systems engineer, or space operations engineer (among other variations).

The B.S. in Aerospace Systems Technology (AST) provides a strong foundation in engineering concepts and technology to support a career working with space systems. The AST program includes coursework with a broader systems and operations focus than a traditional engineering degree. AST is designed for those interested in overall space mission conceptualization, planning and integration of space systems, and spaceflight mission operations and support.
Individuals pursuing this career path must have a solid understanding of engineering concepts underpinned with a comprehensive foundation of science and mathematics – these elements are strongly represented in the curriculum of the AST program. However, AST is not an engineering degree.

Graduates of the AST degree program have been very successful gaining employment in large legacy aerospace firms as well as new venture start-up aerospace companies. For example, AST graduates work and have gained positions with significant levels of responsibility in businesses such as Sierra Nevada, York Space Systems, Raytheon, Boeing, and Lockheed Martin (to name a few).
Other AST graduates have found employment in government agencies such as NASA and not-for-profit private agencies that advocate the aerospace industry.

Advantages of the AST Degree Program:

- More flexible plan of studies than a focused Engineering degree program
- Preparation for careers in space systems project management, space operations, and supporting space-based commercial activities.
- AST graduates are especially attractive to employers grounded in for-profit and entrepreneurial space commerce activities.
- The AST curriculum is flexible and can be adjusted to meet specific areas of interests to the student and potential employers.
- AST graduates are qualified for employment in aerospace as well as the aeronautics industry.
- The AST plan of studies can easily accommodate simultaneously earning MSU Denver Undergraduate Certificates in Space Commercialization and Spacecraft Flight Operations.
- AST students also can earn industry recognized professional certification by Ansys in Systems Toolkit (STK) as part of the AST program coursework.

The following suggested courses (opposite page) comprise an extended major which requires no minor; note that the General Studies courses differ from those required of ASC and AAM programs. Students must work with the Center for Individualized Learning http://www.msudenver.edu/cil/ as well as Dr. Jeff Forrest, Chair of the AVS Department, to ensure that the proposed Individualized Degree Program meets the needs of the individual student as well as those of the industry. Please contact Dr. Forrest regarding questions or applying to this program. NOTE: some recommended courses may vary depending on student interest and career goals.

B.S. AEROSPACE SYSTEMS TECHNOLOGY (AST)

AST RECOMMENDED AEROSPACE CORE COURSE (AES PREFIX) [1]

AES 2050 - Aviation History & Aerospace Development **-or-** AES 1040 - Introduction to Unmanned Aircraft Systems (3)
AES 1050 - Introduction to Space (3)
AES 2607 - Intro to Aerospace Syst. Sim (3) [2, 4, 5]
AES 2630 - Spacecraft Mission Operations I (3) [5]
AES 3530 – Aerodynamics (3)
AES 3600 - Space Flight Operations I (3) [4, 5]
AES 3610 - Elements of Spacecraft Design I (3) [5]
AES 3620 - Aero Syst. Proj & Miss. Sched. (3) [4 (2607 or 3620)]
AES 3630 - Spacecraft Mission Operations II (3) [4]
AES 4601 - Space Flight Operations II (3) [4, 5]
AES 4602 - Aerospace Commercialized Operations (3) [4]
AES 4603 - Aerospace Operations Systems Analysis & Design (3) [4, 5]
AES 3607 - Orbital Mechanics & Aero Systems Sim (3) [2, 5] **-or-**
AES 4620 - Elements of Spacecraft Design II (3) [5=====]

AST Core Courses: 39 credits

AST ADDITIONAL RECOMMENDED COURSES

SSE 1040 - Life Cycle & Systems Engineering - An Intro (3)
CHE 1800 - General Chemistry I (4)
JMP 2610 - Intro to Technical Writing (3)
MET 1010 - Manufacturing Processes (3)
MET 1200 - Technical Drawing I (3)
MET 1310 - Principles of Quality Assurance (3)
EET 2000 - Electric Circuits and Machines (3)
EET 2340 - Technical Programming Applications (3)
-or- CS 1050 Computer Science I (4)
MET 2200 - Materials of Engineering (3)
CET 3135 - Mechanics of Materials with Lab (4)
MET 4000 - Project Engineering (3)
MTH 1120 - College Trigonometry (3)
MTH 1410 - Calculus I (4)
MTH 2410 - Calculus II (4)
PHY 2311 - General Physics I (4)
PHY 2321 - General Physics Laboratory (1)
PHY 2331 - General Physics II (4)
PHY 2341 - General Physics II Laboratory (1)

AST Additional Courses: 56-57 credits

AST - GENERAL STUDIES REQUIREMENTS

To complete the General Studies Program, students must take approved courses that fulfill the following distribution and credit requirements. Refer to the current MSU Denver University Catalog to review approved General Studies coursework and completion requirements.

Written Communication	6
Oral Communication	3
Arts and Humanities	6
Historical	3
Natural and Physical Sciences	6
Social and Behavioral Sciences	6
Global Diversity	0 or 3^
AST General Studies Minimum:	**33**
AST DEGREE TOTAL	**125 - 126**

^ Students may fulfill the global diversity requirement by taking an approved course within one of the following categories: arts and humanities; historical; natural and physical sciences; or social and behavioral sciences.

OTHER COURSES FOR CONSIDERATION IN THE AST PROGRAM

CET 2150 - Mechanics I-Statics (3)
EET 2165 - Electronics Laboratory (1)
EET 2310 - Digital Circuits I (3)
EET 3010 - Industrial Electronics (4)
EET 3620 - Analog and Digital Communications (3)
MET 3110 - Thermodynamics (3)
MET 3160 - Mechanics II – Dynamics (3)
MET 3185 - Fluid Mechanics (3)
MET 3410 - Geometric Dimensioning and Tolerancing (3)

Students seeking the AST program may seek approval for substituting or adding coursework in addition to those classes listed above from the Aviation and Aerospace Science Program (AVS) and the Engineering and Engineering Technology Program (EAET) at MSU Denver. AST students may also seek for credit (a) Independent Study and/or (b) Internship as part of their IDP degree plan for AST.

[1] Consult your program advisor for details on Independent Study, departmental internships, or courses approved for elective credit in this course of study.
[2] Ansys. Systems Toolkit Lab (STK Lab).
[3] These courses may have prerequisites within their respective departments.
[4] Required for *Space Commercialization Certificate*
[5] Required for *Spacecraft Flight Operations Certificate*

B.S. AEROSPACE PHYSICS

Individualized Degree Program (IDP) - **Major: B.S. Aerospace Physics**

The Aerospace Physics (IDP) major is designed to provide a solid academic foundation for those students interested in careers in aerospace or planetary sciences and prepares the student for entrance to graduate school and career opportunities in research. This program provides students with a strong background in space science, planetary science, and other fields related to astronautics and space research, all of which are invaluable for aerospace industry employment.

These suggested courses comprise an extended major which requires no minor; note that the General Studies courses differ from those required in ASC and AAM programs. Students must work with the Center for Individualized Learning (www.msudenver.edu/cil/) as well as Dr. Jeff Forrest, Chair of the AVS Department, to ensure that the proposed Individualized Degree Program meets the needs of the individual student as well as those of the industry. Please contact Dr. Forrest forrestj@msudenver.edu regarding questions or applying to this program

RECOMMENDED CORE

AES 1050 - Introduction to Space
AES 3530 – Aerodynamics (3)
-or- AES 3610 - Elements of Spacecraft Design I (3)
AES 3600 - Space Flight Operations I (3)
AES 2607 - Intro to Aerospace Syst. Sim (3)[2]
AES 3607 - Orbital Mech. & Aerospace Syst. Sim (3)[2]
AES 4601 - Space Flight Operations II (3)
AES 4602 - Aerospace Commercialized Ops. (3)
-or- AES 4620 - Elements of Spacecraft Design II (3)
AES 4603 - Aerospace Ops. Systems Analysis & Design (3)

ADDITIONAL RECOMMENDED COURSES[3]

AST 1040 - Introduction to Astronomy (4)
JMP 2610 - Introduction to Technical Writing (3)
MTH 1210 - Introduction to Statistics (4)
MTH 1410 - Calculus I (4)
MTH 2410 - Calculus II (4)
MTH 2420 - Calculus III (4)
MTH 3420 - Differential Equations (4)
PHY 2311/2321 - General Physics I + Lab (5)
PHY 2331/2341 - General Physics II + Lab (5)
PHY 2711 - Waves and Vibrations (4)
PHY 2811 - Modern Physics I (4)
PHY 3011 - Modern Physics II (3)
PHY 3211 - Analytical Mechanics (4)
PHY 3711 - Physical Laboratory I (2)
PHY 4611 - Computational Physics (2)
PHY 4921 - Physics Senior Seminar (1)
PHY 4990 - General Relativity (3)
PHY 4560 - Planetary Physics (3)

Additional Courses Subtotal: 59 credit hours

ELECTIVES

AVS or PHY: Approved Aerospace or Physics Course[1] (3)
Electives Subtotal: 3 credit hours
General Studies for AVS majors (33-37)

Aerospace Physics Total: 122-126 credit hours

[1] Consult your program advisor for details on Independent Study, departmental internships, or courses approved for elective credit in this course of study.

[2] Ansys. Systems Toolkit Lab (STK Lab).

[3] These courses may have prerequisites within their respective departments.

B.S. UNCREWED AEROSPACE SYSTEMS

Individualized Degree Program (IDP) - **Major: B.S. Uncrewed Aerospace Systems**

The Uncrewed Aerospace Systems (UAS) IDP will provide students with a wide spectrum of topics, forming a strong foundation to compete in the civilian sector in positions related to UAS, with additional opportunities in the military sector. There continues to be a strong demand for UAS professionals given the incorporation of these systems not only in the defense sector, but there is increased use commercially in law enforcement, agriculture, and retail. Studies have shown the need for over 50,000 new jobs in the sector over the last several years and with technology continuing to evolve, this demand is projected to remain. This IDP degree provides knowledge and skills for flight operations and airmanship, mission planning, weather, remote sensing, GIS, and systems integration. This IDP offers four tracks (specializations) that build upon the core courses, which are (1) UAS Advanced Manufacturing, (2) UAS Operations, (3) UAS Science, and (4) UAS Digital Security.

RECOMMENDED AEROSPACE CORE COURSE (AES PREFIX)

AES 1040 - Intro to UAS (3)
AES 1050 - Intro to Space (3)
AES 1100 - Aviation Fundamentals (4)
AES 1400 - Aviation Weather (3)
AES 2050 - Aviation History (3)
AES 2607 - Intro to Aerospace Systems Sim (3)
AES 2040 - UAS Flight & Control (3)
AES 3040 - UAS Data Collection & Analysis (3)
AES 3600 - Space Flight Ops I (3)
AES 3607 - Orbital Mechanics & Aerospace Systems Sim (3)
AES 3220 - Aviation & Aerospace Law (3)

Core Courses: 34 credits

UNCREWED AEROSPACE SYSTEMS GENERAL STUDIES REQUIREMENTS

To complete the General Studies Program, students must take approved courses that fulfill the following distribution and credit requirements. Refer to the current MSU Denver University Catalog to review approved General Studies coursework and completion requirements.

Written Communication	6
Oral Communication	3
Arts and Humanities	6
Historical	3
Natural and Physical Sciences	6
Social and Behavioral Sciences	6
Global Diversity	0 or 3^
General Studies Minimum:	**33**
DEGREE TOTAL	**122 - 126**

^ Students may fulfill the global diversity requirement by taking an approved course within one of the following categories: arts and humanities; historical; natural and physical sciences; or social and behavioral sciences.

ADVANCED MANUFACTURING/INDUSTRIAL DESIGN SPECIALIZATION – 124 credits

This UAS pathway is tailored towards the student that would like to be involved in hands-on production of UAS systems. This can include helping repair fielded systems or assisting with developing new systems on the production line.

Career paths: UAS Logistics/ Technician/ Manufacturing

ADDITIONAL RECOMMENDED COURSES – Advanced Manufacturing/Industrial Design

MET 1010 - Manufacturing Processes (3)

CET 1215 - Engineering Graphics (3)

MET 2200 - Materials of Engineering (3)

MET 1310 - Principles of Quality Assurance (3)

MET 1210 - 3D Modeling (3)

MET 3000 - Manufacturing Analysis (4)

IND 3660 - Computer Aided Modeling (3)*

*Student will need to be registered by IND department, MET 1210 will be sufficient as pre-requisite

MET 3410 - Geometric Dimensioning & Tolerance (3)

MET 3215 - Composites Manufacturing (3)

AMS 1010 - Survey of Advanced Manufacturing & Workplace Preparation (3)

AMS 3010 - Additive Manufacturing Stratasys Certification (3)

Track Specialization Courses: 34 credits

UAS OPERATIONS SPECIALIZATION – 124 credits

This UAS pathway is tailored towards the student that would like to be involved with the operation of UAS systems and geospatial analysis. This can include flying fielded systems, which encompasses supplemental functions of planning, data collection, and analysis.

Career paths: UAS Operator/ Planner, System Analyst

ADDITIONAL RECOMMENDED COURSES – UAS Operations

GIS 1220 - Digital Earth: Geospatial Technology (3)

GEG 1300 - Introduction to Human Geography (3)

GIS 2250 - Geographic Information Systems (4)

GIS 3250 - Cartography (3)

GIS 4840 - Remote Sensing (3)

GIS 4850 - Spatial Modeling in Raster (4)

BUS 1850 - Introduction to Business (3)

GIS 4810 - GIS Programming (3)

GIS 4860 - GIS Applications (4)

IND 3000 - Design Thinking (3)

AES 4601 - Space Flight Operations II (3)

Track Specialization Courses: 36 credits

UAS SCIENCE SPECIALIZATION – 125 credits

This UAS pathway is tailored towards the student that would like to be involved with the design of UAS systems. Emphasis will be placed on theory and hard sciences such that the student can be prepared to make design decisions leveraging scientific principles.

Career paths: UAS Engineer/ Designer

ADDITIONAL RECOMMENDED COURSES – UAS Science

MTH 2540 - Scientific Computing with Python (4)

CET 1215 - Engineering Graphics (3)

MTH 2410 - Calculus II (4)

CIS 2010 - Foundations of Information Systems (3)

MTH 2420 - Calculus III (4)

PHY 2331 - General Physics II (4)

PHY 2341 - General Physics II Laboratory (1)

MTH 3210 - Probability & Statistics (4)

PHY 2811 - Modern Physics I (4)

AES 3530 - Aerodynamics (3)

Track Specialization Courses: 34 credits

UAS DIGITAL SECURITY SPECIALIZATION – 122 credits

This UAS pathway is tailored towards the student that would like to apply UAS systems to real-world applications, such as law enforcement. Emphasis will be placed on cybersecurity and information systems to enable the student to integrate best practices in real-world scenarios.

Career paths: UAS Security/ Law Enforcement

ADDITIONAL RECOMMENDED COURSES – UAS Digital Security

CJC 1010 - Introduction to Criminal Justice (3)

CYB 2001 - Cyber Laws and Regulations (3)

CS 1030 - Computer Science Principles (3)

CSS 2751 - Principles of Cybersecurity (3)

CYB 2500 - Criminal Investigation (3)

CIS 2010 - Foundation of Information Systems (3)

CIS 3230 - Telecommunication Systems and Networking (3)

CJC 405M - Aviation Security (3)

CIS 3050 - Fundamentals of System Analysis and Design (3)

CIS 3500 - Information System Security (3)

CJC 3460 - Crime Mapping and Analysis (3)

Track Specialization Courses: 36 credits

Uncrewed Aerospace Systems Total: 122-126 credit hours

DEPARTMENT MINORS AND CERTIFICATES

Minors: Aviation Technology | Aviation Management
Certificates: Airport Management | Space Commercialization | Unmanned Aircraft Systems

These minors and certificates are designed to afford majors in other disciplines the opportunity to develop an understanding of the aviation and aerospace industries. AVS majors may **not** elect the Aviation Management or Aviation Technology minors. ASC Aviation & Aerospace Science majors (only) may develop an IDP minor. All AAM students must select a minor within the School of Business. NOTE: Students must complete each course used in a certificate program with a grade of "C" or better.

Registration for Certificate in Airport Management, Unmanned Aircraft Systems, or Space Commercialization: You must register with the AVS Department prior to graduation for these certificate programs. Please see the AVS front office for details. Registration is without additional cost. No more than one course substitution is allowed in the AVS certificate programs. These certificates do appear on official transcripts, once completed.

Minor: Aviation Technology

Note: A student must possess at least an FAA Private Pilot Certificate (any category of aircraft) before graduation with this minor.

REQUIRED CORE

AES 1100 - Aviation Fundamentals (4)
AES 1400 - Aviation Weather (3)
AES 1710 - Instrument Flight Simulation I (3)

Core Subtotal: 10 credit hours

AVS - Approved Electives[1] (11)

ADDITIONAL REQUIREMENTS

Professional Pilot Documentation - FAA Private Pilot Certificate (any aircraft category)

Aviation Technology Minor Total: 21

[1] See advisor for elective options or FAA documentation requirements.

Minor: Aviation Management

REQUIRED CORE

AES 1010 – Introduction to Aviation & Aerospace Operations (4)
AES 3220 - Aviation and Aerospace Law (3)

Core Subtotal: 7 credit hours

ELECTIVES *(Choose four (4) of the following courses for a total of twelve (12) credit hours)*[1]

AES 3230 - Airline Management (3)
AES 3240 - Airline Planning (3)
AES 3850 - Human Factors Physiology of Flight (3)
AES 4200 - Airport Planning & Management I (3)
AES 4210 - Airport Planning & Management II (3)
AES 4230 – General-Business Aviation Ops. (3)
AES 4240 - Air Cargo (3)
AES 4870 - Aviation Safety Program Mgt. (3)
AES 4910 - Aviation & Aerospace Str. Planning (3)

Electives Subtotal: 12 credit hours

Aviation Management Minor Total: 19

[1] See your advisor for help selecting appropriate elective courses for your course of study. A total of 12 credit hours in approved aerospace electives are required for this minor.

Certificate: Airport Management

This certificate prepares the student for the American Association of Airport Executives (AAAE) Certified Member examination (see https://www.aaae.org/), often required for airport management positions. Documentation of this certification must be provided by the student to the AVS Department.

NOTE: Students that complete requirements for the AAM degree also fulfill requirements for the Airport Management Certificate. Students must declare the certificate and submit an additional graduation application to receive the certificate.

REQUIRED CORE

AES 3220 - Aviation and Aerospace Law **-or-** AES 3230 - Airline Management **-or-** AES 3240 - Airline Planning (3)
AES 3880 - Aviation Security (3)
AES 4200 - Airport Planning & Management I (3)
AES 4210 - Airport Planning & Management II (3)
AES 4230 - General & Business Aviation Ops. (3)
AES 4870 - Aviation Safety Prog. Management (3)

Aviation Management Certificate Total: 18 (Note: The AVS Department Aviation Security Coordinator Certificate requires a grade of C or better for AES 3880. Please see a faculty advisor for details.)

Certificate: Space Commercialization

This certificate prepares the student with a strong foundation for career development in the commercial space industry - an important and expanding part of the Colorado and national economy! It also expands opportunities for those currently employed in the industry seeking a better understanding of how to leverage space-based resources for enhancing commerce and exploring new entrepreneurial opportunities.

REQUIRED CORE

AES 2607 - Introduction to Aerospace Systems Simulation [1] (3)
-or- AES 3620 - Aerospace Systems Project & Mission Scheduling (3)
AES 3600 - Space Flight Operations I (3)
AES 4601 - Space Flight Operations II (3)
AES 4602 - Aerospace Commercialized Ops. (3)
AES 4603 - Aerospace Ops. Systems Analysis & Design (3)

Space Commercialization Certificate Total: 15

[1] Ansys Systems Toolkit Lab (STK Lab).

Certificate: Unmanned Aircraft Systems (UAS)

This certificate prepares the student with a strong foundation for career development in the commercial unmanned aircraft systems industry as a 14 CFR Part 107 Remote Pilot. It also expands opportunities for those currently employed in the industry seeking a better understanding of how to leverage and manage UAS-based resources for enhancing commerce and exploring new entrepreneurial opportunities. **A student must possess the FAA Part 107 Remote Pilot Certificate before graduation with this certificate.** Students seeking the Certificate in Unmanned Aircraft Systems must earn a grade of C or better for each class required in the program.

REQUIRED CORE

AES - 1040 - Introduction to Unmanned Aircraft Systems (3)
AES - 2040 - Unmanned Aircraft Systems Flight and Control (4)
AES - 3040 - Unmanned Aircraft Systems Data Collections and Analysis (3)
AES - 3980 - Internship in Aviation and Aerospace Science (3 - 6)
AES - Approved - Elective (3)

ADDITIONAL REQUIREMENTS

Professional Pilot Documentation - FAA Part 107 Remote Pilot Certification

Unmanned Aerial Systems (UAS) Certificate
Total: 15 – 18

Individualized Degree Program (IDP) Minors

Minors: Space Commercialization | Air Force Reserve Officer Training Corps

IDP Minor: Space Commercialization

The Space Commercialization minor (IDP), will prepare the student for opportunities and better understanding of commercialized (for-profit) operations in near-Earth or space environments. Space Commercialization is open to all Aviation Technology majors as well as students majoring in other disciplines outside of the AVS Department. This multi-disciplinary minor program blends coursework grounded in basic systems-engineering, space systems integration, and space commercialization (for-profit operations in the space environment). As Colorado is a leader in U.S. space commerce and gross dollars spent in the national aerospace industry, this program is especially viable for MSU Denver's student population. Students taking this minor will also have the opportunity to gain experience in the industry standard *Ansys Systems Toolkit* (STK) orbital dynamics and mission planning simulation system.

REQUIRED CORE

AES 1050 - Introduction to Space (3)
AES 2607 - Intro to Aerospace Syst. Sim (3)
AES 3600 - Space Flight Operations I (3)
AES 3607 - Orbital Mechanics & Aerospace Sys. Simulations[1] (3)
-or- AES 3620 - Aerospace Syst. Prj/ & Miss. Sched. (3)

AES 4601 - Space Flight Operations II (3)
AES 4602 - Aerospace Commercialized Operations (3)
AES 4603 - Aerospace Operations Systems Analysis and Design (3)

Space Commercialization Minor Total: 21

[1] Ansys Systems Toolkit Lab (STK Lab)

IDP Minor: Air Force Reserve Officer Training Corps

The Air Force Reserve Officer Training Corps (AFROTC) minor is open to all students. For more information about this minor, please contact the Center for Individualized Learning at 303-556-8342 or visit www.msudenver.edu/cil/. Students interested in joining the AFROTC may do so through the University of Colorado AFROTC Program. Typically, this involves weekly attendance for training in Boulder. For more information about AFROTC, contact 303-492-3128 or 303-492-3128 or visit www.colorado.edu/ AFROTC/

*Returning for landing after competition flight in the box, High Planes HotPoxia Fest, Fort Morgan, CO, KFMM. (Photographed by **Steve Nelson**)*

Course Term Rotational Schedule & Prerequisites

(Exact term offering may vary. Check University published term schedule for course registration).

(note: Courses are subject to change-- check current schedule)	Fall	Spring	Pre- or Co-requisites
AES 1040 (3) Introduction to Unmanned Aircraft Systems	x	x	
AES 1050 (3) Intro to Space	x	x	
AES 1100 (4) Aviation Fundamentals	x	x	Co-req AES 1400
AES 1400 (3) Aviation Weather	x	x	
AES 1500 (2) Private Pilot Flight Lab	x	x	Instructor Permission
AES 1710 (3) Instrument Flight Sim I	x	x	
AES 2040 (4) Unmanned Aircraft Systems Flight and Control		x	AES 1040
AES 2050 (3) Aviation History & Aerospace Dev	x	x	
AES 2120 (4) Instrument Fundamentals	x	x	AES 1100, AES 1400 & AES 1710
AES 2130 (3) Commercial Flight Operations	x	x	AES 2120
AES 2200 (4) Fundamentals of Air Traffic Control	x	x	AES 1100
AES 2220 (3) Flight Dispatch & Load Planning	x	x	AES 1100 & AES 1400, Algebra recommended
AES 2330 (3) Precision Flight & Navigation (1st Flight Team Course)	x	x	AES 1100 or FAA Private
AES 233A (0) Precision Flight & Navigation Lab (4th Flight Team Course)	x	x	
AES 2500 (2) Instrument Pilot Flight Lab	x	x	AES 1100 and Instructor Permission
AES 2607 (3) Introduction to Aerospace Systems Simulation	x	x	AES 1050
AES 2630 (3) Spacecraft Mission Operations I	x		AES 1050
AES 2710 (3) Instrument Flight Simulation II	x	x	AES 2120
AES 3000 (3) Aircraft Systems & Propulsion	x	x	AES 1100 & Junior Standing, Physics recommended
AES 3040 (4) Unmanned Aircraft Systems Data Collections and Analysis	x		At Least Junior Standing & AES 1040
AES 3220 (3) Aviation and Aerospace Law	x		AES 1100 & at Least Junior Standing
AES 3230 (3) Airline Management	x		At Least Junior Standing
AES 3240 (3) Airline Planning		x	At Least Junior Standing
AES 3330 (2) Intermediate Precision Flight & Nav (2nd Flight Team Course)	x	x	AES 2330 & Junior Standing
AES 3340 (1) Advanced Precision Flight & Nav (3rd Flight Team Course)	x	x	AES 3330 & Junior Standing
AES 3520 (2) Commercial Single-Engine Flight Lab	x	x	FAA Private and Instructor Permission
AES 3530 (3) Aerodynamics	x	x	Junior Standing
AES 3570 (2) Ground Instructor Practicum	x	x	Permission of Instructor
AES 3600 (3) Space Flight Operations	x	x	At Least Sophomore Standing
AES 3607 (3) Orbital Mechanics & Aerospace Systems Sim		x	AES 2607 & Junior Standing
AES 3610 (3) Elements of Spacecraft Design I	x		AES 2607, AES 3600, & Junior Standing
AES 3620 (3) Aerospace Systems Project & Mission Scheduling		x	AES 3600 & Junior Standing
AES 3630 (3) Spacecraft Mission Operations II		x	AES 2630 & Junior Standing

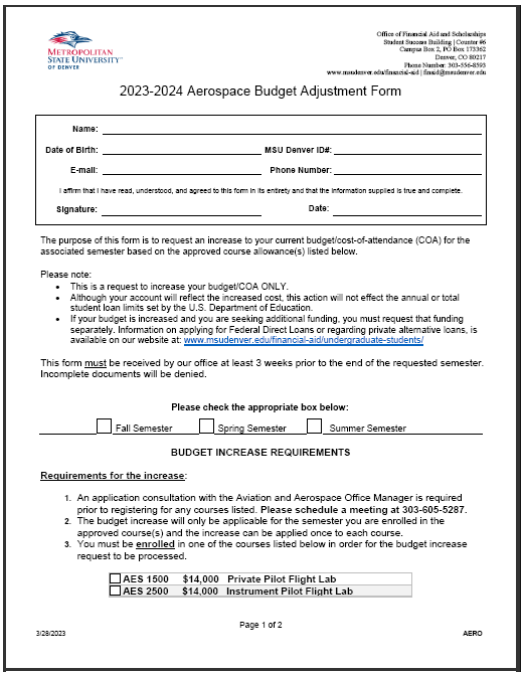
AES 3650 (3) Advanced Flight Technologies	x	x	**AES 2120 & AES 2710, or FAA Instrument**
AES 3710 (3) Multiengine Flight Simulation I	x	x	**AES 2710 or FAA Commercial/Instrument Rate**
AES 3850 (3) Human Factors & Physiology of Flight	x	x	**At Least Junior Standing**
AES 3880 (3) Aviation Security	x	x	**At Least Junior Standing**
AES 4040 (3) Aircraft Performance	x	x	**AES 1100 & AES 3530 & At Least Junior Standing**
AES 4100 (3) Advanced Air Traffic Control	x	x	**AES 1400, AES 2120, AES 2200, & Junior Standing**
AES 4200 (3) Airport Planning & Management I	x	x	**At Least Junior Standing**
AES 4210 (3) Airport Planning & Management II		x	**AES 4200 & Junior Standing**
AES 4230 (3) General & Business Aviation Operations		x	**At Least Senior Standing**
AES 4240 (3) Air Cargo Industry		x	**At Least Junior Standing**
AES 4370 (3) Advanced Navigation Systems	x	x	**AES 2120 & At Least Junior Standing**
AES 4500 (2) Commercial Multi-Engine Flight Lab	x	x	**FAA Commercial and Instructor Permission**
AES 4510 (2) Flight Instructor Flight Lab	x	x	**FAA Instrument, FAA Commercial, Instructor Permission**
AES 4540 (3) FAA Instructor Certification -Ground	x	x	**AES 2130 or FAA Commercial & Instrument**
AES 4590 (2) Flight Instructor Practicum	x	x	**Permission of Instructor**
AES 4601 (3) Space Flight Operations II		x	**AES 3600 & Junior Standing**
AES 4602 (3) Aerospace Commercialization Operations	x	x	**AES 3600 & AES 4601 & Junior Standing**
AES 4603 (3) Aerospace Ops Sys Anal & Design	x		**AES 4601 & Junior Standing**
AES 4607 (3) Orbital Analysis & Aerospace Systems Sim	x	x	**Algebra, Physics, or Astronomy recommended**
AES 4610 (3) Aerodynamic Design			**AES 3530 & Junior Standing**
AES 4620 (3) Elements of Spacecraft Design II		x	**AES 3610 & Junior Standing**
AES 4710 (4) Turboprop Flight Simulation		x	**Instrument/Commercial, AES 2710, AES 3710 or Multi-engine**
AES 4860 (3) Aviation Safety	x	x	**At Least Junior Standing**
AES 4870 (3) Aviation Safety Program Mgmt	x		**At Least Junior Standing**
AES 4910 (3) Aviation & Aerospace Strategic Planning	x	x	**At Least Junior Standing**
AES 4930 (3) Professional Flight Standards Seminar	x	x	**Completion or Concurrent Enrollment in all AVS classes**
AES 4935 (4) Advanced Commercial Aircraft Systems	x	x	**AES 3000 & AES 3530 & AES 4040 & Commercial/Instrument Cert/Rating**

*Note: AES 3980 - Internship in Aviation/Aerospace is offered every Spring, Summer, & Fall - email Dr. Jeffrey Forrest forrestj@msudenver.edu for details

**Note: All upper division classes (3000 prefix level and higher) require, at minimum, Junior Class Standing (60 credit hours or more)

Aerospace Budget Adjustment Form

The Aerospace Budget Adjustment Form is used to assist students financially while completing flight training. Upon registration for any of the classes listed on the form, the student will be reimbursed with the amount it would cost to take one credit hour. Students can use this money to pay for their certifications and ratings.



Office of Financial Aid and Scholarships
Student Success Building | Counter #6
Campus Box 2, PO Box 173362
Denver, CO 80217
Phone Number: 303-556-8593
www.msudenver.edu/financial-aid | finaid@msudenver.edu

2023-2024 Aerospace Budget Adjustment Form

Name: _____

Date of Birth: _____ MSU Denver ID#: _____

E-mail: _____ Phone Number: _____

I affirm that I have read, understood, and agreed to this form in its entirety and that the information supplied is true and complete.

Signature: _____ Date: _____

The purpose of this form is to request an increase to your current budget/cost-of-attendance (COA) for the associated semester based on the approved course allowance(s) listed below.

Please note:

- This is a request to increase your budget/COA ONLY.
- Although your account will reflect the increased cost, this action will not effect the annual or total student loan limits set by the U.S. Department of Education.
- If your budget is increased and you are seeking additional funding, you must request that funding separately. Information on applying for Federal Direct Loans or regarding private alternative loans, is available on our website at: www.msudenver.edu/financial-aid/undergraduate-students/

This form must be received by our office at least 3 weeks prior to the end of the requested semester. Incomplete documents will be denied.

Please check the appropriate box below:

☐ Fall Semester ☐ Spring Semester ☐ Summer Semester

BUDGET INCREASE REQUIREMENTS

Requirements for the increase:

1. An application consultation with the Aviation and Aerospace Office Manager is required prior to registering for any courses listed. Please schedule a meeting at 303-605-5287.
2. The budget increase will only be applicable for the semester you are enrolled in the approved course(s) and the increase can be applied once to each course.
3. You must be enrolled in one of the courses listed below in order for the budget increase request to be processed.

☐ AES 1500	$14,000	Private Pilot Flight Lab
☐ AES 2500	$14,000	Instrument Pilot Flight Lab

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2023-2024 Aerospace Budget Adjustment Form

☐ AES 3520	$28,000	Commercial Single-Engine Flight Lab
☐ AES 4500	$10,000	Commercial Multi-Engine Flight Lab
☐ AES 4510	$8,000	Flight Instructor Flight Lab
☐ AES 4520	$7,000	Flight Instructor- Instrument
☐ AES 4530	$9,000	Flight Instructor- Multi-Engine
☐ AES 4550	$35,000	Flight Helicopter
☐ AES 4570	$5,000	Airline Transport Pilot
☐ AES 4580	$40,000	Turbojet Flight Engineer or Type Rating

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10/15/2021 AERO

Note: This is not the official Aero Budget Adjustment Form. Please contact the AVS Front Office at aviationandaerospace@msudenver.edu for the official MSU Denver form for submission.

Campus Map

Metropolitan State University of Denver

Aviation and Aerospace Science Department

Seventh Street Classroom

1250 7th Street, Room 102, Campus Box 30, P.O. Box 173362

Denver, Colorado 80217-3362

(303) 605-5287 phone

http://www.msudenver.edu/aviation/