CURRICULUM GUIDE

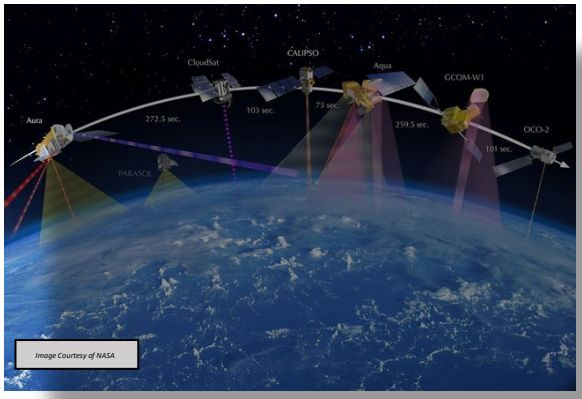


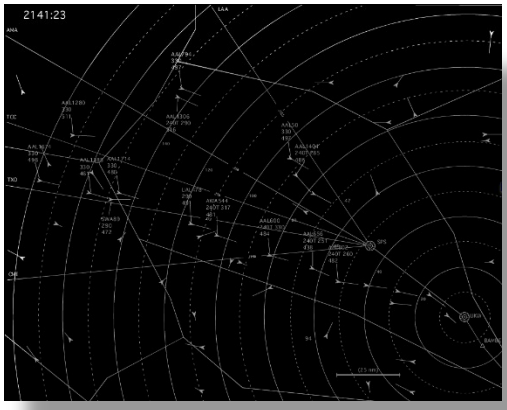
Image Courtesy of NASA

Aviation and Aerospace Science Department

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

Metropolitan State University of Denver

2026 - 2027



October 2026 Edition 22

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. **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.**
5. **Register for Classes:** For registration, follow the Register tab of StudentHub http://www.msudenver.edu/studenthub/ for procedures and dates.
6. **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/
7. **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
8. **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/
9. **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.
10. **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.
11. **Registration for Certificate in Airport Management, Space Commercialization, or Unmanned Aircraft Systems:** You must register with the AVS Department prior to graduation.
12. **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.

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

Welcome to

Aviation and Aerospace Science

at MSU Denver!

Welcome from the Chair

Greetings and welcome to the Aviation and Aerospace Science Department at Metropolitan State University of Denver. For over 40 years, we have been teaching and training students in our passion for flight – *both in the air and in space!*

If you are interested in a collegiate education related to any aspect of aviation or aerospace science, then you have arrived at your destination. Our graduates are working in all areas of aviation as professional aviators, aviation managers, airport planners, air traffic controllers, flight dispatchers and much more. Our students have the opportunity combine study in aerospace science, physics, and engineering to seek new opportunities in the aerospace industry. For those interested in the space sciences, we offer unique programs in space commercialization, space physics and space systems engineering technology.

Our department is truly *"student-centered."* We are focused on your education and the development of your professional career. Each member of our department's faculty has completed a career in aviation or aerospace prior to their appointment as professional educators within our program.

We offer the highest quality and most affordable undergraduate aviation education in the country. MSU Denver's tuition and fees are so affordable that you will be able to pay for much of your flight training or other types of certification with the money you save.

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.

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

Michael Botyarov, Ph.D., PMP – Assistant Professor & Associate Chair
mbotyaro@msudenver.edu | Ph.D. Colorado State University, PMP Project Management Institute, 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.

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.

Michael Gref, M.S. – Assistant Professor – General Aviation & Flight Training Advisor, Corporate Pilot Careers
| migref@msudenver.edu | BS Aviation Management, Walla Walla University; MS Aviation and Aerospace Management, Purdue University; FAA Commercial ASEL/AMEL, Instrument, BE-300 Type Rating, Glider LSA, FAA CFI-I, MEI, IGI. Specializes in: flight/ground training, aviation weather, advanced aircraft systems, crew resource management, and aviation curriculum.

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.

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 schoolinstruction.

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.

Marlene Price, M.B.A. – Lecturer
maprice@msudenver.edu | BA Chemistry/Biochemistry, University of Colorado Boulder, MBA Technology Management, University of Phoenix Southern California.

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

Autumn 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.

Wes Phillips, B.S. – Technical Systems Administrator - Aeronautics and Aerospace Systems Laboratories
(303) 615-0991 | wphill16@msudenver.edu | B.S. Aviation and Aerospace Science. Specializes in laboratory operations, simulator maintenance, and special projects.

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.

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

Sierra Lucero – Assistant Office Manager & Outreach Coordinator - Administration
720-490-9100 | silucero@msudenver.edu | Specializes in: Course Scheduling, Office Finances, Front Office Student Employee Management

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

Mary Tran
Aviation and Aerospace Academic Advisor, College of Aerospace, Computing, Engineering and Design
303-605-5287 | mtran27@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.

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.

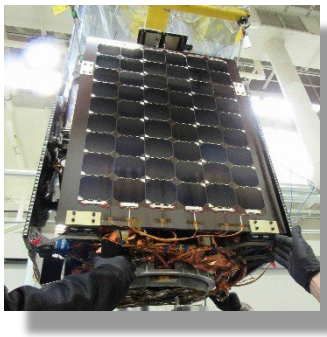
Astronautics Simulation Laboratory

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 budget adjustment form is available online here and must be submitted to MSU Denver Office of Financial Aid after signing up for the flight lab, 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)

Note – Military VA students do not enroll in 2 credit-hour lab courses; instead, they are assigned aviation elective classes to substitute for these labs. Military VA students are the only students who may use AES electives rather than flight labs. If a Military student elects to enroll in a flight lab course, they will pay out-of-pocket for the tuition and fees for the lab. For more information, please contact an aviation advisor.

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.

Student Organizations

Precision Flight Team - (National Intercollegiate Flying Association (https://nifa.aero) 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. Contact: Mike Forney, mforney@msudenver.edu.

Aerobatic Team - (National Collegiate Acrobatics & Tumbling Association (https://thencata.org) 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. Contact: Dagmar Kress, dkress3@msudenver.edu.

American Association of Airport Executives AAAE (https://www.aaae.org) 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. Contact: Annmarie Heth, aheth@msudenver.edu.

MSU Denver Women in Aviation WAI (https://www.wai.org) 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. Contact: Dagmar Kress, dkress3@msudenver.edu.

Alpha Eta Rho (https://www.alphaetarho.org/cpages/home) 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. Contact Kevin Kuhlmann kuhlmank@msudenver.edu.

National Gay Pilots Association NGPA (https://www.ngpa.org/universitiesflightschools) The National Gay Pilots Association (NGPA) is an organization that supports LGBTQ+ aviators through advocacy, education, and social events. Contact: Dagmar Kress, dkress3@msudenver.edu.

Glider Club (https://www.coloradosoaring.org/ssa/coll/home.htm) The Glider Club offers Metropolitan State University of Denver students and faculty opportunities to learn about and experience gliding, promoting aviation education and skill development. Contact: Dagmar Kress, dkress3@msudenver.edu.

Organization Of Black Aerospace Professionals OBAP (https://obap.org) The Organization of Black Aerospace Professionals (OBAP) is dedicated to enhancing the representation of African Americans and other minorities in aviation and aerospace through education, training, and mentorship programs. Contact: Casey Phinney, phinney@msudenver.edu.

Colorado Aviation Business Association CABA (https://www.mycaba.org) The Colorado Aviation Business Association (CABA) advocates for the interests of Colorado's aviation businesses by promoting growth, enhancing networking opportunities, and supporting educational initiatives within the industry. Contact: Annmarie Heth, aheth@msudenver.edu.

MSU Denver Latino PIiots Association LPA (https://www.latinopilot.org) committed to its mission to INSPIRE, MENTOR, and DEVELOP the Latin Aerospace and Aviation Communities, further eliminating socio-economic barriers through representation, financial support, education, and mentorship.

Professional Asian Pilot's Association (https://www.asianpilots.org) Professional Asian Pilots Association (PAPA) was created in April 2017 by a passionate group of airline pilots. What started as a singular group chat between a group of friends gradually evolved into a full-fledged organization, connecting and empowering individuals who share the same vision to overcome Asian underrepresentation in the aviation industry. Contact: Dagmar Kress, dkress3@msudenver.edu.

Colorado Drone Soccer Team Become part of the 1st collegiate drone soccer team in America. Contact: Casey Phinney, phinney@msudenver.edu.

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.

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.

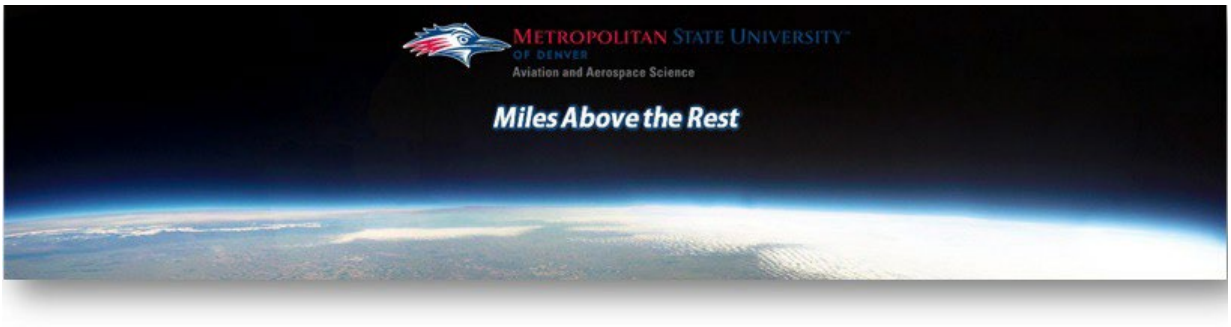
University Entry Point. Candidates applying to Aviate through the University Entry Point must:

- Be working toward or graduated with at least one of the following from an Aviate university partner:
    - A degree that provides eligibility for an R-ATP certificate
    - A professional pilot degree
- Completed at least two semesters of full-time coursework at an Aviate university partner
- Be in good standing with your university and uphold their student code of conduct
- Hold a minimum of a Commercial Pilot Certificate with Instrument Rating
- Must have a legal right to work in the United States without sponsorship
- Must be able to travel freely within the United States and without restriction to all destinations United serves
- Hold a valid FAA medical certificate that was originally issued as a first- or second-class medical certificate
- Have no more than two Certified Regulatory Checkride failures, and no more than three total checkride failures, inclusive of both Primary Training Failures and Certificated Regulatory Checkride failures

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

UNITED Aviate

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, B.S. (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, B.S. (AAM) degree

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

Aerospace Systems and Mission Design, B.S. (ASMD) degree

- Aerospace Systems and Mission Design (ASMD) - Space mission conceptualization, design and integration of space systems, spaceflight mission operations, graduate school preparation

Aerospace (IDP) programs and degree concentrations

- Aerospace Physics (IDP) space science, space exploration, physics, 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. Military VA students using AVS electives instead of flight lab courses must consult with an aviation advisor regarding specific VA-approved AVS electives.

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.

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 (3 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 (3); 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. For questions, please contact Prof. Michael Botyarov (mbotyaro@msudenver.edu)

REQUIRED CORE (ASC1)

AES 1040 - Introduction to Unmanned Aircraft Systems (3) -
or- AES 1050 - Introduction to Space (3)
AES 1010 - Intro to Aviation & Aero Mgmt (3)
AES 1400 - Aviation Weather (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 4603 - Aero Ops Sys Analysis & Design (3) (Sr. Exp)
AES 3620 - Aerospace Syst. Prj/ & Miss. Sched. (3) **-or-**
AES 3630 - Spacecraft Mission Ops II (3)
AES 4860 - Aviation Safety (3)
AES 4870 - Aviation Safety Program Management (3)
AES 4910 - Aviation & Aerospace Strat. Plan. (3)
JMP 2610 - Introduction to Technical Writing (3) **-or-**
BUS 1950 - Business Communication (3)

Core Subtotal: 61 credit hours

REQUIREMENTS SUMMARY:
Major Core (**61**) + General Studies (**33 minimum**) + Minor or Unrestricted Electives (**22-28**) = 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 1010 - Intro to Aviation and Aero Mgmt
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: 14 - 15 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 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)
Unrestricted Elective
Total: 16 Sem. Hrs.

Semester 5
AES 3600 - Space Flight Operations I
AES 3880 - Aviation Security
JMP 2610 or BUS 1950
Unrestricted Elective
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)
Unrestricted Elective (recommend 4 credits)
Total: 13 Sem. Hrs.

Semester 7
AES 4200 - Airport Planning & Management I
AES 3620 Aero Sys Proj & Mission Sched **-or-** AES 3630 Spacecraft Mission Ops II
AES 4860 - Aviation Safety
AES 4870 - Aviation Safety Program Management
Unrestricted Elective (recommend 4 credits)
Total: 15-16 Sem. Hrs.

Semester 8
AES 4602 - Aerospace Commercialized Operations -or- AES 4210 Airport Planning & Mgmt II
AES 4603 - Aero Ops Sys Analysis & Design (Sr. Exp)
AES 4910 - Av & Aero Str Planning
Unrestricted Elective
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 to 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 (1) a multi-engine land rating or (2) FAA Flight Instructor certificate (CFI) before graduation. Before enrolling in this concentration, ensure that you can obtain an FAA first-class medical certificate and be eligible for flight training in the United States. For a list of FAA medical examiners, see https://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 before entering our ASC2 program. For information related to Flight Program Policies, Flight Training FAQs, FAA Restricted-ATP authorization, and Aviation Class Sequence, please contact either Prof. Chad Kendall (ckendal4@msudenver.edu) or Prof. Tyler Bachelder (bacheldt@msudenver.edu).**

REQUIRED CORE (ASC2)

AES 1040 - Intro to Unmanned Aircraft Sys (3) **-or-**
AES 2050 - Aviation Hist & Aero Develop (3)
AES 1100 - Private Pilot Ground (4)
AES 1400 - Aviation Weather (3)
AES 1500 - Private Pilot Flight Lab (2)
AES 1710 - Inst Flight Simulation I (3**)**
AES 2120 - Instrument Pilot Ground (4)
AES 3000 - Aircraft Systems & Propulsion (3)
AES 3130 - Comm Pilot Ground (3)
AES 2200 - Fundamentals of Air Traffic Control (4)
AES 2220 - Flight Dispatch & Load Planning (3)
AES 2500 - Instrument Pilot Flight Lab (2)
AES 2710 - Instrument Flight Simulation II (3)
AES 3520 - Comm Single-Engine Flight Lab (2)
AES 3530 - Aerodynamics (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 4560 - Crew Resource Management (3)
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 minimum**) + Unrestricted Electives* (**9**). 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 - Private Pilot Ground
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 Pilot Ground
AES 2500 - Instrument Pilot Flight Lab
AES 1040 - Intro to UAS -or- AES 2050 Aviation & Aerospace History & Development
AES 2220 - Flight Dispatch & 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 3850 - Human Factors & Phys of Flight
Historical GS (ESSJ or GD)
Soc. & Beh. Science GS (ESSJ or GD if needed)
Total: 16 Sem. Hrs.

Semester 5
AES 3130 - Commercial Pilot Ground
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 Navigation 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
AES 4560 - Crew Resource Management
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
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 Private Pilot Ground	AES 1500* Private Pilot Flight Lab	
Semester 2			AES 1710 Instrument Sim I
Semester 3	AES 2120 Instrument Pilot Ground	AES 2500* Instrument Pilot Flight Lab	
Semester 4			AES 2710 Instrument Sim II
Semester 5	AES 3130 Commercial Pilot Ground	AES 3520* Commercial Single-Engine Flight Lab	
Semester 6	AES 4540 FAA Flight Instructor Ground	AES 4500* (Commercial Multi-engine) OR 4510* (Flight Instructor)	AES 3710 Multi-Engine Sim

* Note – Military VA students do not enroll in 2 credit-hour lab courses; instead, they are assigned aviation elective classes to substitute for these labs. For more information, please contact an aviation advisor. Military VA students are the only students who may use AES electives rather than flight labs.

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

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.

List of MSU Denver FAA Approved 141 Flight Training Providers (updated Spring 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) Epic Flight Academy – Centennial Airport (KAPA) Englewood, Colorado
4) McAir Aviation – Rocky Mountain Metropolitan Airport (KBJC) Broomfield, Colorado
5) Peterson Air Force Base – Rocky Mountain USAF Flight Training Center (Peterson ASB Aero Club) – Colorado Springs Airport (KCOS) Colorado Springs, Colorado - **Must be member eligible**
6) Western Air Flight Academy – Rocky Mountain Metropolitan Airport (KBJC) Broomfield, Colorado
7) Western Air Flight Academy – Colorado Air and Space Port (KCFO) Watkins, Colorado

R-ATP 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 Pilot Ground (AES 2120) and Commercial Pilot Ground (AES 3130) **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 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 - Private Pilot Ground (4)
AES 1400 - Aviation Weather (3)
AES 1710 - Instrument Flight Simulation I (3)
AES 2120 - Instrument Pilot Ground (4)
AES 2200 - Fundamentals of Air Traffic Control (4)
AES 3220 - Aviation and Aerospace Law (3)
AES 3850 - Human Factors & Phys. (3)
AES 3880 - Aviation Security (3)
AES 4100 - Advanced Air Traffic Control (3)
AES 4200 - Airport Planning & Mgmt 1 (3)
AES 4230 - General and Business Av Ops (3)
AES 4860 - Aviation Safety (3)
AES 4870 - Aviation Safety Program Management (3)
AES 4910 - Aviation & Aero Strategic Planning (3)
AES 4930 - Professional Flight Standards Seminar (Sr. Exp.) (3)

Core Subtotal: 48 credit hours

REQUIREMENTS SUMMARY:
Major Core (**48**) + AES Electives (**27**) + Minor or additional Unrestricted Electives (**9-12**) AVS General Studies (**33 minimum**) = 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 - Private Pilot Ground
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: 13 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 Pilot Ground
AES 2200 - Fundamentals of Air Traffic Control
Nat. & Phy. Science GS
Soc. & Beh. I GS (MC or GD)
Total: 13 Sem. Hrs.

Semester 4
AES 3220 - Aviation and Aerospace Law
AES 3850 - Human Factors
AES Elective
AES Elective
Soc. & Beh. II GS (MC or GD)
Total: 15 Sem. Hrs.

Semester 5
AES 3880 - Aviation Security
AES 4200 - Airport Plan I
AES Elective
AES Elective
History GS (MC or GD if needed)
Total: 15 Sem. Hrs.

Semester 6
AES 4230 – General and Business Aviation Ops
AES Elective
Arts & Humanities GS (MC or GD if needed)
Unrestricted Elective or Minor
Unrestricted Elective or Minor
Total: 15 Sem. Hrs.

Semester 7
AES 4860 - Aviation Safety
AES 4870 - Aviation Safety Program Management
AES 4910 - Aviation & Aerospace Str Planning
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
Unrestricted Elective or Minor
Unrestrictive 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. For questions, please contact Annmarie Heth (aheth@msudenver.edu)

REQUIRED CORE (AAM)

AES 1040 - Introduction to Unmanned A/C Syst. (3) **-or-**
AES 1050 - Introduction to Space (3)
AES 1010 - Intro to Aviation & Aero Management (3)
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: 60 credit hours

REQUIREMENTS SUMMARY:
Major Core (**60**) + General Studies (**33 minimum**) + Unrestricted Electives **(27-30)** = Aviation and Aerospace Management Total: **120-123** 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 1010 - Intro to Aviation & Aero Mgmt
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
Unrestricted Elective
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
Unrestricted Elective
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
Unrestricted Elective
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.)
Unrestricted Elective
Total: 15 Sem. Hrs.

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

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

B.S. AEROSPACE SYSTEMS AND MISSION DESIGN (ASMD)

Major: B.S. Aerospace Systems and Mission Design (ASMD) The ASMD program is designed for those seeking career opportunities in space mission conceptualization, design and integration of space systems, and spaceflight mission operations and support throughout the entirety of the life cycle. In addition to industry opportunity upon graduation, the B.S. Aerospace Systems and Mission Design offer the graduate a solid foundation from which to continue graduate work in a variety of domains related to aerospace operations and technical management.

REQUIRED AES CORE (ASMD)

AES 1050 - Introduction to Space (3)
AES 1910 - Aero. Industry Exploration & Analysis (3)
AES 2607 - Intro to Aerospace Syst. Sim (3)
AES 2630 - Spacecraft Mission Ops I (3)
AES 3600 - Space Flight Operations I (3)
AES 3620 - Aero. Syst Project & Mission Sched (3)
AES 3640 - Fund of Aero Syst. Analysis & Design (4)
AES 4601 - Space Flight Operations II (3)
AES 4602 - Aerospace Commercialization Ops (3)
AES 4603 - Aerospace Ops Syst. Analysis & Design (3)
AES 4640 - Aerospace Model-Based Syst. Analysis (3)
AES 4650 - Aero. Software and Missions Vis. Tools (3)

REQUIRED ANCILLARY COURSES (ASMD)

CHE 1800 - General Chemistry I (4)
CS 1050 - Computer Science I (4)
CSS 2751 - Principles of Cybersecurity (3)
EET 2000 - Electric Circuits & Machines (3)
GIS 2250 - Geographic Information Systems (4)
GIS 4840 - Remote Sensing (3)
JMP 2610 - Intro to Technical Writing (3)
MTH 1110 - College Algebra for Calculus (4)
MTH 1120 - College Trigonometry (3)
MTH 1410 - Calculus I (4)
PHY 2311 - General Physics I (4)
PHY 2321 - General Physics I Lab (1)

Core & Required Ancillary Course Subtotal: 77 credit hours

REQUIREMENTS SUMMARY:
Major Core and Required Ancillary (**77**) + General Studies (**33 minimum**) + Electives **(18)*** = ASMD Total: **125-128** credit hours. Total program hours must equal at least **120** credit hours. Be sure to plan all your electives accordingly. *(NOTE: Please see the current MSU Denver Academic Catalog for elective course options: Catalog).

Degree Plan for Aerospace Systems & Mission Design (ASMD)

Semester 1
AES 1050 - Intro to Space
AES 1910 - Aero. Industry Exploration & Analysis
1110 - College Algebra for Calculus
Written Communication GS

Total: 13 Sem. Hrs.

Semester 2
MTH 1120 - College Trigonometry
CHE 1800 - General Chemistry
Written Communication GS
Historical GS
Oral Communication GS

Total: 16 Sem. Hrs.

Semester 3
CS 1050 - Computer Science I
MTH 1410 - Calculus I
IND 3000 - Design Thinking (Recommended Soc. & Beh. GS)
Arts & Humanities GS

Total: 14 Sem. Hrs.

Semester 4
AES 2607 - Intro to Aero. Sys. Sim.
PHY 2311 & PHY 2321 - General Physics I & Lab (Rec. Nat & Phys GS)
JMP 2610 - Intro to Technical Writing
CSS 2751 - Principles of Cybersecurity

Total: 14 Sem. Hrs.

Semester 5
AES 2630 - Spacecraft Mission Ops I
AES 3600 - Space Flight Ops I MTH
PHI 3370 - Comp.,Ethics, & Soc.
CET 3120 Engineering Economy

Total: 12 Sem. Hrs.

Semester 6
AES 3640 - Fund. Of Aero. Syst. Analysis & Design
AES 4601 - Space Flight Operations II
GIS 2250 - Geographic Information Systems
EET 2000 - Elect. Circuits & Machines
Elective Course for Major

Total: 17 Sem. Hrs.

Semester 7
AES 3620 - Aero. Syst. Project & Mission Sched.
AES 4602 - Aero. Commercialization Operations
AES 4603- Aero. Operations Syst. Analysis & Des.
GIS 4840 - Remote Sensing
ESSJ Requirement

Total: 15 Sem. Hrs.

Semester 8
AES 4640 - Aerospace Model-Based Syst. Analysis
AES 4650 - Aerospace Software & Mission Vis. Tools
Elective Course for Major
Elective Course for Major

Total: 12 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).

METROPOLITAN STATE UNIVERSITY℠
OF DENVER
Advanced Manufacturing Sciences Institute

Advanced Manufacturing Sciences, B.S. with Aerospace Concentration

Advanced Manufacturing uses cutting-edge science and innovative technology including 3D printing, augmented reality, virtual reality, artificial intelligence, Internet of Things (IoT), machine learning, and robotics to improve manufacturing production processes. Advanced Manufacturing requires professionals with advanced skills who are creative, critical thinkers, and problem-solvers. Students will acquire real-world learning through state-of-the-art manufacturing equipment and materials, soft skills through carefully chosen curriculum, and collaborations with the professional community to augment the development of skills, knowledge, and dispositions that enable our graduates to immediately fill sought-after positions within advanced manufacturing industries.

The aerospace sector is one of the largest and most powerful industries in the United States supplying five markets: military aircraft, missiles, space, commercial airliners, and general aviation. The U.S. aerospace sector is considered the largest in the world and is the main supplier of both military and civil aerospace hardware to the rest of the world. The Aerospace Concentration introduces students to aerospace operations and prepares them to contribute to the assembly, integration and test of air and spacecraft that make our lives on earth better.

For more information, review the Advanced Manufacturing website at msudenver.edu/advanced-manufacturing
Contact: amsi@msudenver.edu

Advanced Manufacturing Core Courses: 44 credits

AMS 1010 - Survey of Advanced Manufacturing and Workplace Preparation (3)
AMS 3010 - Additive Manufacturing Stratasys Certification Preparation (3)
CS 1030 - Computer Science Principles (4)
CSS 2751 - Principles of Cybersecurity (3)
CSS 3753 - Computing and Security for Manufacturing (3)
ELE 1001 - Introduction to Electrical Engineering (3)
MET 1200 - Technical Drawing I (3)
JMP 2610 - Introduction to Technical Writing (3)
MET 1010 - Manufacturing Processes (3)
MET 1310 - Principles of Quality Assurance (3)
MET 2010 - CNC Machining and Inspection (3)
MET 3000 - Manufacturing Analysis (4)
MET 3630 - Lean Manufacturing Systems Engineering (3)
MTH 1120 - College Trigonometry (3)

Aerospace Concentration Courses: 27 credits

AES 1050 - Introduction to Space (3)
AES 2607 - Introduction to Aerospace Systems Simulation (3)
AES 3530 - Aerodynamics (3)
AES 3600 - Space Flight Operations I (3)
AES 3610 - Elements of Spacecraft Design I (3)
AES 3850 - Human Factors and Physiology of Flight (3)
AES 4601 - Space Flight Operations II (3)
AES 4603 - Aerospace Operations Systems Analysis and Design (3)
AES 4620 - Elements of Spacecraft Design II (3)

MSU DENVER

Advanced Manufacturing Sciences Institute

ADVANCED MANUFACTURING SCIENCES MAJOR, B.S.

Aerospace Concentration

SAMPLE ACADEMIC PLAN OF STUDY

The following academic plan is a *sample* pathway to completing degree requirements for this major/concentration within four years.

GS – General Studies
ESSJ - Ethnic Studies & Social Justice (3) credit hours
GD – Global Diversity (3) credit hours

Semester 1 - Fall	
Course	**Hours**
Written Communications (GS) ENG 1010 Composing Arguments	3
Oral Communication (GS)	3
Arts & Humanities (GS; ESSJ or GD)	3
Quantitative Literacy (GS) **Suggested:** MTH 1110 - College Algebra for Calculus	4
AMS 1010 Survey of Advanced Manufacturing & Workplace Prep	3
TOTAL CREDIT HOURS	**16**

Semester 2 - Spring	
Course	**Hours**
Written Communications (GS) ENG 1020 Research and Argument Writing	3
Historical (GS; ESSJ or GD)	3
Arts & Humanities (GS; ESSJ or GD)	3
MET 1010 Manufacturing Processes ***OR*** IND 2830 Manufacturing Materials and Processes	3
MTH 1120 College Trigonometry	3
TOTAL CREDIT HOURS	**15**

Semester 3 - Fall	
Course	**Hours**
AES 1050 Introduction to Space	3
ELE 1001 Introduction to Electrical Engineering	3
JMP 2610 Introduction to Technical Writing	3
Natural & Physical Sciences (GS) **Suggested:** MET 1040 Introduction to Engineering	3
MET 1200 Technical Drawing ***OR*** IND 1450 Technical Drawing and CAD ***OR*** CET 1215 Engineering Graphics	3
TOTAL CREDIT HOURS	**15**

Semester 4 - Spring	
Course	**Hours**
AES 2607 Introduction to Aerospace Systems Simulation	3
AES 3530 Aerodynamics	3
MET 1310 Principles of Quality Assurance	3
Natural & Physical Sciences (GS) **Suggested:** PHY 2010 - College Physics I ***AND*** PHY 2030 College Physics I Laboratory	5
Social & Behavioral Science (GS)	3
TOTAL CREDIT HOURS	**17**

Semester 5 - Fall	
Course	**Hours**
AES 3600 Space Flight Operations I	3
AMS 3010 Additive Manufacturing Stratasys Cert Prep	3
MET 2010 CNC Machining and Inspection	3
MET 3000 Manufacturing Analysis	4
AES 3850 Human Factors and Physiology of Flight	3
TOTAL CREDIT HOURS	**16**

Semester 6 - Spring	
Course	**Hours**
AES 4601 Space Flight Operations II	3
CS 1030 - Computer Science Principles	4
Social & Behavioral Sciences (GS) **Suggested:** CET 3120 Engineering Economy	3
MET 3630 Lean Manufacturing Systems Engineering	3
TOTAL CREDIT HOURS	**13**

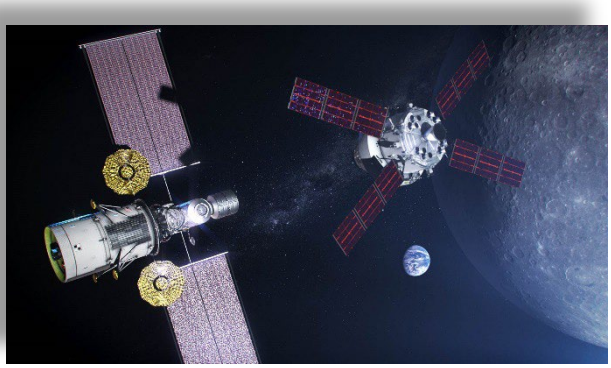
Semester 7 - Fall	
Course	**Hours**
AES 3610 Elements of Spacecraft Design I	3
AES 4603 Aerospace Operations System Analysis and Design	3
CSS 2751 - Principles of Cybersecurity	3
Elective	3
Elective	3
TOTAL CREDIT HOURS	**15**

Semester 8 - Spring	
Course	**Hours**
AMS 4950 Professional Internship	3
AES 4620 Elements of Space Craft Design II	3
CSS 3753 Computing & Security for Manufacturing	3
Elective	3
Elective	3
TOTAL CREDIT HOURS	**15**

Metropolitan State University of Denver reserves the right to withdraw courses; revise the academic calendar; or change curriculum, graduation procedures, requirements and policies that apply to students at any time.

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 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 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 | Spacecraft Flight Operations

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 - Private Pilot Ground (4)
AES 1400 - Aviation Weather (3)
AES 1710 - Instrument Flight Simulation I (3)

Core Subtotal: 10 credit hours

AES - Electives[1] :9 credits (3 upper division)

ADDITIONAL REQUIREMENTS

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

Aviation Technology Minor Total: 19

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

Minor: Aviation Management

REQUIRED CORE

AES 1100 – Private Pilot Ground (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 th e 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 (4)

AES - Approved Elective (6) (See catalog for Elective Course List)

ADDITIONAL REQUIREMENTS

Professional Pilot Documentation - FAA Part 107 Remote Pilot Certification

Unmanned Aerial Systems (UAS) Certificate Total: 17

Certificate: Spacecraft Flight Operations

This certificate prepares the student with a strong foundation in specialized training for career development in the space and aerospace industry as a Spacecraft Mission and Flight Operations Specialist. It also expands opportunities for those currently employed in the industry seeking a stronger understanding of spacecraft operations command and control operations through an applied approach utilizing specialized laboratory and scenario training resources in ground segments, flight dynamics, satellite communication, mission planning and modeling, and space environment factors.

REQUIRED CORE

AES 2607 - Introduction to Aerospace Systems Simulation[1] (3)

AES 2630 - Spacecraft Mission Operations I (3)

AES 3600 - Space Flight Operations I (3)

AES 3630 - Spacecraft Mission Operations II (3)

AES 4601 - Space Flight Operations II (3)

AES 3607 - Orbital Mechanics and Aerospace Systems Simulations (3)
-or- AES 3610 - Elements of Spacecraft Design I (3)
-or- AES 4603 - Aerospace Operations Systems Analysis and Design (3)

Space Commercialization Certificate Total: 18

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

Campus Map

Metropolitan State University of Denver

Aviation and Aerospace Science Department

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