Aerospace Engineering (AERO)

College of Engineering and Mines
Department of Mechanical Engineering (https://www.uaf.edu/cem/programs/mechanical-engineering/)
907-474-7136

AERO F254 Unmanned Aircraft Systems (UAS) Investigation
3 Credits
Offered As Demand Warrants
An introductory analysis of unmanned air systems (UAS), including typical missions and performance expectations for various classes of UAS. Students investigate subsystem choices for a UAS and how these affect mission performance. Includes discussion of external factors impacting UAS design choices, including support infrastructure, flight operations and data requirements.
Cross-listed with ME F254.
Lecture + Lab + Other: 3 + 0 + 0
Grading System: Letter Grades with option of Plus/Minus

AERO F256 Unmanned Aircraft Systems (UAS) Design
3 Credits
Offered As Demand Warrants
A multidisciplinary team of students will design, build, test and deliver an unmanned aircraft system (UAS) in support of university research mission requirements. Students will learn basic concepts related to the systems engineering design process. Graded events include team briefings, written reports, multimedia products and a finished UAS product.
Prerequisites: AERO F254; ME F254.
Cross-listed with CS F254 and ME F256.
Lecture + Lab + Other: 3 + 0 + 0
Grading System: Letter Grades with option of Plus/Minus

AERO F258 Unmanned Aircraft Systems (UAS) Operations
3 Credits
Offered As Demand Warrants
Covers the use of unmanned aircraft systems (UAS), sensors, and support infrastructure required to conduct a selected mission set. Emphasis is on mission analysis, planning, and conduct, including definition of requirements/constraints, identification of appropriate assets, flight planning considerations, and data analysis requirements. Teams coordinate resources for mission and report results.
Cross-listed with CS F258; GEOS F258; ME F258.
Lecture + Lab + Other: 3 + 0 + 0
Grading System: Letter Grades with option of Plus/Minus

AERO F450 Theory of Flight
3 Credits
Offered Fall
Airfoil theory in subsonic flow. Performance, stability and control of aircraft. Aircraft design.
Prerequisites: ES F341 (may be taken concurrently); ES F346.
Cross-listed with ME F450.
Lecture + Lab + Other: 3 + 0 + 0
Grading System: Letter Grades with option of Plus/Minus

AERO F451 Aerodynamics
3 Credits
Offered Spring
Aerodynamics of non-lifting and lifting airfoils in incompressible irrotational flow, wings of finite span, the Navier–Stokes equations, boundary layers, numerical methods, supersonic and transonic flow past airfoils, rocket aerodynamics, rocket drag.
Prerequisites: ES F341 (may be taken concurrently); ES F301; ES F346.
Cross-listed with ME F451.
Lecture + Lab + Other: 3 + 0 + 0
Grading System: Letter Grades with option of Plus/Minus

AERO F452 Introduction to Astrodynamics
3 Credits
Offered Fall
Geometry of the solar system, detailed analysis of two-body dynamics and introduction to artificial satellite orbits; Hohmann transfer and patched conics for lunar and interplanetary trajectories. Elements of orbit determination.
Prerequisites: ES F208 or ES F210; ES F301 (may be taken concurrently).
Cross-listed with ME F452.
Lecture + Lab + Other: 3 + 0 + 0
Grading System: Letter Grades with option of Plus/Minus

AERO F453 Propulsion Systems
3 Credits
Offered Spring
Basic principles of propulsion: turbojet, turboprop and rocket engines. Fluid mechanics and thermodynamics of flow in nozzles, compressors, combustors and turbines. Liquid and solid propellant rockets. Heat transfer in rocket motors and nozzles. Design and testing methods for components of propulsion systems.
Prerequisites: ME F313 (may be taken concurrently); ES F341.
Cross-listed with ME F453.
Lecture + Lab + Other: 3 + 0 + 0
Grading System: Letter Grades with option of Plus/Minus

AERO F455 Systems Design Seminar
1 Credit
Offered As Demand Warrants
The interdisciplinary design of autonomous robots and other advanced systems using a rigorous systems engineering approach. Systems will be taken from concept studies to a preliminary design through the fabrication, assembly and testing phases. Uses computer science tools such as integrated 3D simulations and parametric computer-aided design (CAD).
Prerequisites: CS F201 or ES F201.
Cross-listed with CS F454.
Special Notes: Each semester will be at a different phase of a different design, so this course may be repeated multiple times for credit.
Lecture + Lab + Other: 1 + 0 + 0
Grading System: Pass/Fail Grades
Repeatable for Credit: May be taken 6 times for up to 6 credits

AERO F465 Space Mission and Spacecraft Design
3 Credits
Offered As Demand Warrants
Course contains information relevant to plan space missions and design spacecraft for aerospace and related engineering disciplines: (1) space environment and common orbits; (2) spacecraft subsystems – structures, attitude determination and control, command and data handling, communications, electrical power systems, thermal control, propulsion and payloads; (3) system tradeoffs and design.
Prerequisites: EE F102; PHYS F211X.
Cross-listed with EE F465.
Lecture + Lab + Other: 3 + 0 + 0
Grading System: Letter Grades with option of Plus/Minus

AERO F654 UAS Systems Design
3 Credits
Offered Fall Even-numbered Years
Course covers the analysis of unmanned air vehicle subsystems, including support infrastructure elements comprising an unmanned air system. Course contains mission planning considerations, including flight planning and data requirements. Focus is on remote sensing missions which may be accomplished by appropriate UAS. Students participate in a UAS design/build/fly workshop.
Prerequisites: Graduate standing.
Cross-listed with EE F654.
Lecture + Lab + Other: 3 + 0 + 0
Grading System: Letter Grades with option of Plus/Minus

AERO F656 Aerospace Systems Engineering
3 Credits
Offered Fall Odd-numbered Years
A multidisciplinary team of students will perform a preliminary design study of a major aerospace system. Design considerations will include requirements for project management, aerospace vehicle design, power, attitude control, thermal control, communications, computer control and data handling.
Prerequisites: Graduate standing.
Cross-listed with EE F656; ME F656.
Lecture + Lab + Other: 3 + 0 + 0
Grading System: Letter Grades with option of Plus/Minus

AERO F658 Unmanned Aircraft Systems (UAS) Operations
3 Credits
Offered Spring
Covers application of unmanned aircraft systems (UAS) to satisfy scientific research or public service missions. Students analyze mission requirements and recommend appropriate UAS vehicles, subsystems, sensors and data analysis tools to accomplish a specified mission. Students design mission profiles, conduct representative missions, produce required data products and present mission results.
Prerequisites: Graduate standing.
Cross-listed with CS F658; EE F658.
Lecture + Lab + Other: 3 + 0 + 0
Grading System: Letter Grades with option of Plus/Minus

AERO F660 Rocket Systems Design
3 Credits
Offered As Demand Warrants
A multidisciplinary team of students will perform the design, construction and flights of a simple rocket system. Design considerations will include requirements for project management, rocket vehicle design, performance, thrust, stability, recovery system, telemetry and payload data.
Prerequisites: Graduate standing in engineering or physics.
Cross-listed with CS F660; EE F660; ME F660.
Lecture + Lab + Other: 3 + 0 + 0
Grading System: Letter Grades with option of Plus/Minus