AEROSPACE ENGINEERING (AERO)

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AERO Courses

AERO 1121 Aerospace Fundamentals (2 units)
Term Typically Offered: F

Introduction to the engineering profession including the aeronautical and astronautical fields. Engineering approach to problem-solving and analysis of data obtained from experiments. Basic nomenclature and design criteria used in the aerospace industry. Applications to basic problems in the field. 1 lecture, 1 laboratory. Formerly AERO 121.

AERO 2200 Special Problems for Undergraduates (1-3 units)
Term Typically Offered: F, SP
Prerequisite: Consent of department chair.

Individual investigation, research, studies, or surveys of selected problems. Repeatable up to 3 units. Formerly AERO 200.

AERO 2220 Aerospace Engineering Dynamics (3 units)
Term Typically Offered: F, SP
Prerequisite: CE 204, ME 211, or ENGR 2211.

Fundamentals of kinematics and dynamics of particles and rigid bodies. Kinematics of particle and rigid body motion. Newton's 2nd law. Work-energy and momentum methods. Introduction to three-dimensional kinematics and reference frames. Course may be offered in classroom-based or online format. 3 lectures.

AERO 2270 Special Topics (1-3 units)
Term Typically Offered: TBD
Prerequisite: Consent of instructor.

Directed group study of special topics. The Class Schedule will list topic selected. Repeatable up to 6 units. 1 to 3 lectures. Formerly AERO 270.

AERO 3300 Engineering Numerical Analysis (4 units)
Term Typically Offered: F
2026-28 or later: Upper-Div GE Area 2/5
2020-26 catalogs: Upper-Div GE Area B
Prerequisite: Junior standing; completion of GE Area 1 with grades of C- or better (GE Area A for the 2020-26 catalogs); completion of GE Area 2 with a grade of C- or better (GE Area B4 for the 2020-26 catalogs); and MATH 244 or MATH 2341.

Numerical methods for solving aerospace engineering problems in the areas of fluids, thermodynamics, dynamics, control, and structures using modern computing techniques. Numerical precision, iterative methods, numerical integration, Runge-Kutta solvers, finite difference, singular value decomposition and Eigen-problem solutions. Course may be offered in classroom-based or online format. 3 lectures, 1 laboratory. Fulfills GE Areas Upper-Division 2 or Upper-Division 5 (GE Area Upper-Division B for students on the 2020-26 catalogs).

AERO 3301 Thermo Fluid Dynamics (4 units)
Term Typically Offered: F
Prerequisite: ME 212 or AERO 2220. Corequisite: AERO 300 or AERO 3300.

Thermo-fluid-flow properties, standard atmosphere, dimensional analysis, closed-open-isolated systems, laws of thermodynamics, Navier Stokes relations, thermodynamic equations of state and related variables, thermodynamic processes, control volume analysis, (in)compressible internal-external flows, isentropic flow, normal-oblique shocks, compression-expansion waves, (un)steady flows, laminar-turbulent flows. Course may be offered in classroom-based or online format. 4 lectures.

AERO 3302 Thermo Fluids Laboratory (1 unit)
Term Typically Offered: F
Corequisite: AERO 3301.

Experiments and analysis in applied fluid mechanics, thermodynamics, and heat transfer. Comparisons of analog and digital data sensors and acquisition for applications of conservation of mass, momentum, and energy. 1 laboratory.

AERO 3303 Heat and Mass Transfer (2 units)
Term Typically Offered: SP
Prerequisite: AERO 3301 or AERO 299 and AERO 302; and AERO 300 or AERO 3300.

Convection, conduction, and radiation as methods for heat transfer. Specific topics will cover calorically, thermally perfect, and real gas effects, thermodynamic cycle analysis and efficiencies, Rayleigh-Fanno flows, forced-free convection, radiative gases/surfaces, emission-irradiation spectrum, and radiation shields. Course may be offered in classroom-based or online format. 2 lectures. Formerly AERO 303.

AERO 3304 Aerospace Propulsion Systems (3 units)
Term Typically Offered: SP
Prerequisite: CHEM 124 or CHEM 1120. Corequisite: AERO 303 or AERO 3303.

Power plant types, components, characteristics, and requirements. Principles of thrust and energy utilization for low and high-speed applications. Thermodynamic processes and performance of gas turbines and ramjets, as well as chemical, electric, and nuclear rocket propulsion. Course may be offered in classroom-based or online format. 3 lectures. Formerly AERO 401.

AERO 3305 Introduction to Aerodynamics (3 units)
Term Typically Offered: SP
Prerequisite: AERO 300 or AERO 3300; and AERO 3301 or AERO 299 and AERO 302.

Introduction to aerodynamics and its application to a variety of flight conditions. Analytical and empirical relation. Airfoil/wing characteristics corrections for such things as compressibility and wing sweep accounting for the generation of forces and moments. Course may be offered in classroom-based or online format. 3 lectures. Formerly AERO 306.

AERO 3310 Air and Space (3 units)
Term Typically Offered: F, SP, SU
2026-28 or later: Upper-Div GE Area 2/5
2020-26 catalogs: Upper-Div GE Area B
Prerequisite: Junior standing; completion of GE Area 1 with grades of C- or better (GE Area A for the 2020-26 catalogs); completion of GE Area 5A (GE Area B1 for the 2020-26 catalogs); and completion of GE Area 2 with a grade of C- or better (GE Area B4 for the 2020-26 catalogs).

Technological developments of modern aircraft and spacecraft through physics of flight equations, mission analysis, propulsion, structures, materials, and control systems for civil and military aircraft/spacecraft. Synthesis of current and future aerospace technologies through emerging ethical considerations and global impact. Course may be offered in classroom-based or online format. 3 lectures. Crosslisted as AERO 3310/HNRS 3313. Fulfills GE Areas Upper-Division 2 or Upper-Division 5 (GE Area Upper-Division B for students on the 2020-26 catalogs). Formerly AERO/HNRS 310.

AERO 3320 System Dynamics (3 units)
Term Typically Offered: SP
Prerequisite: AERO 300 or AERO 3300; and AERO 2220 or ME 212.

Introduction to system dynamics principles including dynamics equilibrium and stability. Linearization using perturbations and Taylor series. Laplace Transforms, transfer functions and system response. Equivalent systems, time and frequency domain analysis, and control of linear dynamic systems. Course may be offered in classroom-based or online format. 2 lectures, 1 laboratory. Formerly AERO 320.

AERO 3331 Aerospace Structural Analysis I (4 units)
Term Typically Offered: F
Prerequisite: CE 204, ENGR 2211, or ME 211; and MATE 210 or MATE 1220. Corequisite: AERO 300 or AERO 3300.

Thin-walled cylindrical and spherical pressure vessels. Euler column buckling. Engineering and principal strains. Stress tensor. Principal stresses. Balance equations. Linear thermoelastic material behavior. Bending, torsion, and shear of advanced beams. Course may be offered in classroom-based or online format. 4 lectures. Formerly AERO 331.

AERO 3351 Introduction to Orbital Mechanics (3 units)
Term Typically Offered: SP
Prerequisite: AERO 300 or AERO 3300; and AERO 2220 or ME 212.

Motion of a body in a central field. Keplerian Orbits. Orbital maneuvers. Interplanetary trajectories. Rocket Trajectories. Course may be offered in classroom-based or online format. 3 lectures. Formerly AERO 351.

AERO 3361 Introduction to AERO for Transfer Students (1 unit)
Term Typically Offered: F
Prerequisite: Junior standing.

Introduction to Aerospace Engineering and its application in professional practice. Engineering approach to problem-solving and analysis of data obtained from experiments. Familiarization with 3-D dynamics and rotation/coordinate systems. Not open for students with credit for AERO 1121 and AERO 2220. Course may be offered in classroom-based or online format. 1 lecture.

AERO 3460 Aerospace Engineering Professional Preparation (1 unit)
Term Typically Offered: F
Prerequisite: Junior standing.

Professional development for student success including overview of aerospace industry, current events in the aerospace industry, graduate studies, engineering ethics and culture, intellectual property, non-disclosure agreements, teamwork, and innovation and entrepreneurship. Course may be offered in classroom-based or online format. 1 lecture. Formerly AERO 460.

AERO 4400 Special Problems for Advanced Undergraduates (1-3 units)
Term Typically Offered: F, SP, SU
Prerequisite: Consent of instructor.

Individual investigation, research, studies, or surveys of selected problems. Repeatable up to 6 units. Formerly AERO 400.

AERO 4401 Ground to Space Propulsion (2 units)
Term Typically Offered: F
Prerequisite: AERO 401 or AERO 3304.

Propulsion design for aircraft and spacecraft. Air-breathing propulsion systems performance and component characteristics. Rocket performance, chemical rockets, electric thrusters, thruster placement, system layout, component design, and systems integration. Course may be offered in classroom-based or online format. 2 lectures.

AERO 4402 Spaceflight Propulsion (2 units)
Term Typically Offered: F
Prerequisite: AERO 401 or AERO 3304.

Aerospace propulsion design characteristics, performance, and integration for chemical, electric, and nuclear propulsion. Transatmospheric and interplanetary propulsion components and integration. Course may be offered in classroom-based or online format. 2 lectures. Formerly AERO 402.

AERO 4403 Propulsion Laboratory (1 unit)
Term Typically Offered: F
Prerequisite: AERO 401 or AERO 3304. Corequisite: AERO 402, AERO 4401, or AERO 4402.

Experimental data collection and analysis of jet and rocket propulsion systems. Experiments in solid, liquid, and hybrid rockets, electric propulsion, propellers, and gas turbines. Experiments on nozzle characteristics in compressible flow. 1 laboratory.

AERO 4405 Advanced Aerodynamics (3 units)
Term Typically Offered: F
Prerequisite: AERO 306 or AERO 3305.

Analysis techniques and their application to a variety of flight conditions. Subsonic aerodynamics, viscous drag prediction, supersonic aerodynamics, and hypersonic aerodynamics. Course may be offered in classroom-based or online format. 3 lectures. Formerly AERO 405.

AERO 4406 Experimental Aerodynamics (1 unit)
Term Typically Offered: F
Prerequisite: AERO 3301 or AERO 299 and AERO 302. Recommended: AERO 306 or AERO 3305.

Experimental aerodynamics, experimental testing, validation, measurement techniques, load measurements, pressure measurements, flow visualization, demonstrations of advanced techniques, low-speed and high-speed measurements, measurement uncertainty, error analysis and propagation, reading instrument datasheets, and selection of suitable ranges for commercially available devices. 1 laboratory.

AERO 4407 Applied Computational Aerodynamics (3 units)
Term Typically Offered: F
Prerequisite: AERO 300 or AERO 3300; and AERO 3301 or AERO 299 and AERO 302. Recommended: AERO 306 or AERO 3305.

Application of Computational Fluid Dynamics and other computational methods to study a range of problems relating to applications in aerospace engineering. Grid generation, sources of errors in numerical studies, boundary conditions, 2D and 3D external flows, and turbulence modeling. Course may be offered in classroom-based or online format. 2 lectures, 1 laboratory. Formerly AERO 406.

AERO 4408 Re-Entry Aerodynamics (3 units)
Term Typically Offered: TBD
Prerequisite: AERO 3301 or AERO 299 and AERO 302. Recommended: AERO 351 or AERO 3351; and AERO 306 or AERO 3305.

Near planet environments. Transition from orbital to aero-dynamic motion. Aerodynamic heating and effects on design. Entry, descent, and landing. Course may be offered in classroom-based or online format. 3 lectures. Formerly AERO 407.

AERO 4409 Aerospace Flight Test (3 units)
Term Typically Offered: TBD
Prerequisite: AERO 306 or AERO 3305.

Aerospace flight test introduction. Flight test preparation. Flight test design. Flight test execution. Ground control station procedures and team organization. Radio communication. Flight test data analysis and reduction. Flight test reporting. 1 lecture, 2 laboratories. Formerly AERO 409.

AERO 4420 Aircraft Dynamics and Control (3 units)
Term Typically Offered: F
Prerequisite: AERO 306 or AERO 3305; and AERO 320 or AERO 3320.

Aircraft flight mechanics. Equilibrium, static and dynamics stability. Aircraft maneuvers. Longitudinal and lateral stability and stick fixed. Stick free neutral point. Analysis of latero-directional equilibrium flight conditions. Introduction to flight dynamics and automatic flight control. 3 lectures. Formerly AERO 420.

AERO 4421 Spacecraft Attitude Dynamics and Control (3 units)
Term Typically Offered: F
Prerequisite: AERO 320 or AERO 3320; and AERO 351 or AERO 3351.

On orbit disturbances, spin stabilization, gravity-gradient, and momentum exchange devices. Control law design and analysis using frequency- and time- domain methods. Fundamentals of attitude determination, guidance, and navigation systems, including Kalman Filters. Course may be offered in a classroom-based or online format. 3 lectures. Formerly AERO 421.

AERO 4422 Flight Dynamics and Automatic Control (3 units)
Term Typically Offered: F
Prerequisite: AERO 420 or AERO 4420.

Airplane attitude representation. Airplane flight dynamics. General equation of unsteady motion. Stability derivatives. Stability of uncontrolled motion (longitudinal). Stability of uncontrolled motion (lateral). Airplane response to control actuation. Automatic stability and control. 3 lectures.

AERO 4425 Aircraft Performance (3 units)
Term Typically Offered: F
Prerequisite: AERO 306 or AERO 3305.

Fundamentals of propeller and jet aircraft performance. Level flight, gliding, climbing. Takeoff and landing. Federal Aviation Regulations related to performance. Turning and pull-ups. Energy methods. 3 lectures. Formerly AERO 425.

AERO 4431 Aerospace Structural Analysis II (3 units)
Term Typically Offered: SP
Prerequisite: AERO 331 or AERO 3331.

Energy methods and variational principles. Betti-Maxwell reciprocity theorem. Rayleigh-Ritz method. Statically indeterminate structures. Bending, extension, and buckling of thin plates. Free vibrations of beams and plates. Finite element method for bar and beam elements. Course may be offered in classroom-based or online format. 3 lectures. Formerly AERO 431.

AERO 4433 Experimental Stress Analysis (1 unit)
Term Typically Offered: F, SP
Prerequisite: AERO 331 or AERO 3331.

Stress analysis and aerospace structural analysis. Individual and group design project dealing with aerospace structures. Field trip required. 1 laboratory. Formerly AERO 433.

AERO 4446 Spacecraft Electrical and Electric Systems (3 units)
Term Typically Offered: SP
Prerequisite: ME 212 or AERO 2220; AERO 351 or AERO 3351; and PHYS 143 or PHYS 1143.

Basic satellite types and applications with specifics applied to power and communication. Interactions between subsystems and their effects on the overall system design. Detailed analysis of key subsystems on a spacecraft with special emphasis on power and communications subsystems. Course may be offered in classroom-based or online format. 3 lectures. Formerly AERO 446.

AERO 4450 Introduction to Aerospace Systems Engineering (3 units)
Term Typically Offered: F
Prerequisite: Graduate or senior standing.

Systems engineering processes and concepts in aerospace. Multidisciplinary approaches to the design, realization, technical management and planning for the development of aerospace systems and subsystems. Course may be offered in classroom-based or online format. 3 lectures.

AERO 4452 Intermediate Orbital Mechanics (3 units)
Term Typically Offered: F
Prerequisite: AERO 351 or AERO 3351; or graduate standing.

Relative orbital motion and rendezvous, linearization of the equations of motion. Clohessy-Wiltshire equations. Two-impulse rendezvous. Asphericity of the earth, aerodynamic drag, solar radiation pressure, n-body perturbations on an orbit. Encke, Cowell, Variation of Parameters solution techniques. Course may be offered in classroom-based or online format. 3 lectures. Formerly AERO 452.

AERO 4455 Space Environments (3 units)
Term Typically Offered: F
Prerequisite: AERO 300 or AERO 3300; and AERO 303 or AERO 3303.

Effects of the space environment on a spacecraft and design considerations. Issues include Launch, vacuum, neutral, particulate, radiation, thermal and plasma environments. Course may be offered in classroom-based or online format. 3 lectures. Formerly AERO 355.

AERO 4456 Space Environments Laboratory (1 unit)
Term Typically Offered: F
Corequisite: AERO 355 or AERO 4455.

Effects of the space environment on a spacecraft and design considerations through laboratory experiments. Laboratories included the areas of launch, vacuum, neutral, particulate, radiation, thermal and plasma environments. 1 laboratory.

AERO 4457 Introduction to Human Spaceflight (3 units)
Term Typically Offered: SP
Prerequisite: Senior standing or graduate standing. Recommended: AERO 351 or AERO 3351; and AERO 355 or AERO 4455.

Requirements and considerations for human spaceflight design and operations. Effects of the spaceflight environment on the human body and countermeasures to mitigate those effects. Designing a spacecraft for the human payload focusing on space operations. Course may be offered in classroom-based or online format. 3 lectures. Formerly AERO 455.

AERO 4461 Aircraft Design Senior Project I (3 units)
Term Typically Offered: F
Prerequisite: AERO 401 or AERO 3304; AERO 306 or AERO 3305; AERO 320 or AERO 3320; AERO 331 or AERO 3331; AERO 460 or AERO 3460; and IME 144 or IME 1140.

Design of an aircraft system using multidisciplinary analysis techniques developed in previous engineering courses. Determination of system requirements, mission characteristics and system lifecycle. Analysis of design characteristics to evaluate performance and functional characteristics. Preparation of technical drawings, briefings, and reports. Field trip required. 3 laboratories. Formerly AERO 443.

AERO 4462 Aircraft Design Senior Project II (3 units)
Term Typically Offered: SP
Prerequisite: AERO 401 or AERO 4401; AERO 405 or AERO 4405; and AERO 443 or AERO 4461.

Continuation of the design of an aircraft system from Aircraft Design I, using multidisciplinary analysis techniques. Organization of technical activities, system architecture, technology integration, and planning for development, test and manufacturing. Analysis of design characteristics. Preparation of drawings and briefings. Field trip required. 3 laboratories. Formerly AERO 445.

AERO 4463 Spacecraft Design Senior Project I (3 units)
Term Typically Offered: F
Prerequisite: AERO 401 or AERO 3304; AERO 320 or AERO 3320; AERO 331 or AERO 3331; AERO 351 or AERO 3351; AERO 460 or AERO 3460; and IME 144 or IME 1140.

Design of a spacecraft system using multidisciplinary analysis techniques developed in previous engineering courses. Determination of system requirements, mission characteristics and system lifecycle. Analysis of design characteristics to evaluate performance and functional characteristics. Preparation of technical drawings, briefings, and reports. 3 laboratories. Formerly AERO 447.

AERO 4464 Spacecraft Design Senior Project II (3 units)
Term Typically Offered: SP
Prerequisite: AERO 402 or AERO 4402; AERO 446 or AERO 4446; and AERO 447 or AERO 4463.

Continuation of the design of a spacecraft system from Spacecraft Design I, using multidisciplinary analysis techniques. Organization of technical activities, system architecture, technology integration, and planning for development, test and manufacturing. Analysis of design characteristics. Preparation of drawings and briefings. 3 laboratories. Formerly AERO 449.

AERO 4470 Special Advanced Topics (1-3 units)
Term Typically Offered: TBD
Prerequisite: Consent of instructor.

Directed group study of special topics for advanced students. The Class Schedule will list topic selected. Repeatable up to 6 units. 1 to 3 lectures. Formerly AERO 470.

AERO 4471 Special Advanced Laboratory (1-3 units)
Term Typically Offered: TBD
Prerequisite: Consent of instructor.

Directed group laboratory study of special topics for advanced students. The Class Schedule will list topic selected. Repeatable up to 6 units. 1 to 3 laboratories. Formerly AERO 471.

AERO 4495 Cooperative Education Experience (1-3 units)
Term Typically Offered: F, SP, SU
CR/NC
Prerequisite: Consent of instructor.

Work experience related to aerospace engineering. Positions are paid and usually require relocation and registration in course for one term. Registration in course is required at start of work experience. Formal evaluation by work supervisor required. Repeatable up to 6 units. Credit/No Credit grading only. Formerly AERO 493.

AERO 5500 Individual Study (1-3 units)
Term Typically Offered: F, SP, SU
Prerequisite: Consent of department chair, graduate advisor, and supervising faculty member.

Advanced study planned and completed under the direction of a member of the department faculty. Enrollment by petition. Repeatable up to 9 units. Formerly AERO 500.

AERO 5504 Finite Element Analysis of Continua (4 units)
Term Typically Offered: SP
Prerequisite: One of the following: BMED/CE/ME 404, BMED/CE/ME 4404, CE 501, CE 5502, AERO 431, or AERO 4431.

Finite element theory and application with a focus on numerical implementation. Strong and weak forms, variational theorems, displacement based methods, mixed methods, viscoelasticity and plasticity type formulations, augmented Lagrangian formulations, transient and modal analysis, and finite deformation. 3 lectures, 1 laboratory. Crosslisted as AERO/BMED/CE/ME 5504. Formerly CE/ME 504.

AERO 5507 Computational Aerodynamics (3 units)
Term Typically Offered: TBD
Prerequisite: Graduate standing in Aerospace Engineering; or AERO 3301, or AERO 299 and AERO 302. Recommended: AERO 300 or AERO 3300; and AERO 306 or AERO 3305.

Classification of partial differential equations. Numerical methods applicable to the solution of elliptic, parabolic, and hyperbolic partial differential equations. Consideration of accuracy and stability of numerical methods. Application to the fundamental equations of fluid dynamics, grid generation, turbulence modeling. Course may be offered in classroom-based or online format. 3 lectures. Formerly AERO 525.

AERO 5522 Boundary-Layer Theory (3 units)
Term Typically Offered: SP
Prerequisite: Graduate standing in Aerospace Engineering; or AERO 3301, or AERO 299 and AERO 302. Recommended: AERO 306 or AERO 3305.

Concept of boundary-layer. Boundary-layer equations, similarity transformation, integral and differential methods for steady, two-dimensional laminar and turbulent boundary layers, hypersonic boundary layers. Course may be offered in classroom-based or online format. 3 lectures. Formerly AERO 522.

AERO 5526 Spacecraft Thermal/Fluid Control (3 units)
Term Typically Offered: TBD
Prerequisite: Graduate standing in Aerospace Engineering; or AERO 3301, or AERO 299 and AERO 302, and AERO 303 or AERO 3303.

Satellite thermal/fluid control hardware. Governing equations for flow and heat transfer. Surface tension and liquid/vapor interface. Heat transfer by free convection, forced convection and radiation in low-gravity environment. Heat pipes. Capillary-pumped loops. Cryogenic systems. Fluid management in space. Course may be offered in classroom-based or online format. 3 lectures. Formerly AERO 526.

AERO 5534 Aerospace Structural Dynamics Analysis (3 units)
Term Typically Offered: F
Prerequisite: Graduate standing in Aerospace Engineering.

Vibrations of single-degree-of-freedom (SDOF) and multi -degree-of-freedom (MDOF) systems. Lagrange's equations. Hamilton's principle. Bending and torsional vibrations of beams. Rayleigh-Ritz and Galerkin methods. Divergence. Aileron reversal. Classical flutter analysis. The k and pk methods. Aeroelastic flutter by assumed-modes method. Course may be offered in classroom-based or online format. 3 lectures. Formerly AERO 534.

AERO 5540 Advanced Ground to Space Transportation (3 units)
Term Typically Offered: TBD
Prerequisite: Graduate standing in Aerospace Engineering, AERO 401, or AERO 3304.

Systems perspective on propulsion systems for space transportation. Includes launch vehicles and in-space propulsion. Chemical, electric, and nuclear rocket characteristics and performance. Combined cycle propulsion for atmospheric and space transportation. Course may be offered in classroom-based or online format. 3 lectures. Formerly AERO 540.

AERO 5541 Hypersonic Airbreathing Propulsion (3 units)
Term Typically Offered: SP
Prerequisite: Graduate standing in Aerospace Engineering, AERO 401, or AERO 3304.

Systems perspective on propulsion concepts for hypersonic applications. Stream thrust analysis, thermochemistry, vehicle and engine component design criteria, performance and integration. Ramjet, scramjet and combined cycle configurations for hydrocarbon and hydrogen propellant designs. Course may be offered in classroom-based or online format. 3 lectures. Formerly AERO 541.

AERO 5548 Complexity in Engineered Systems (3 units)
Term Typically Offered: SP
Prerequisite: Graduate standing in Aerospace Engineering.

Complexity and its relation to systems engineering in the design and development of modern large engineered systems, with emphasis on aerospace applications. Methods to manage complexity, including systems thinking, model-based systems engineering, and life cycle governance. Course may be offered in classroom-based or online format. 3 lectures. Formerly AERO 548.

AERO 5549 Systems Engineering Applications (3 units)
Term Typically Offered: TBD
Prerequisite: Graduate standing in Aerospace Engineering, AERO 450, or AERO 4450.

Use of Systems Engineering principles and methods for project management. Program planning, scheduling and budgeting, risk management, and design strategies to meet system/mission requirements. Quality function development. Proposal development and evaluation. Course may be offered in classroom-based or online format. 3 lectures. Formerly AERO 549.

AERO 5553 Advanced Control Theory (3 units)
Term Typically Offered: TBD
Prerequisite: Graduate standing in Aerospace Engineering.

Advanced control theory analysis techniques. Analytical and computational methods applied to dynamic systems. State space system representation, solutions to dynamic systems, non-linear and linear stability analysis, full-state and output feedback, controllability and observability and advanced modern control. Course may be offered in classroom-based or online format. 3 lectures. Formerly AERO 553.

AERO 5557 Advanced Orbital Mechanics (3 units)
Term Typically Offered: TBD
Prerequisite: One of the following: Graduate standing in Aerospace Engineering, AERO 351, AERO 3351, AERO 452, or AERO 4452.

Initial orbit determination using angles only methods. Various Solutions to Lambert's Problem. Orbit and transfer optimization, libration points, halo orbits, and secondary orbit perturbations. Course may be offered in classroom-based or online format. 3 lectures. Formerly AERO 557.

AERO 5560 Advanced Spacecraft Dynamics and Control (3 units)
Term Typically Offered: TBD
Prerequisite: Graduate standing in Aerospace Engineering, AERO 421, or AERO 4421.

Advanced attitude determination and control of spacecraft. Attitude control and analysis of rigid body spacecraft via reaction wheels, control moment gyros, thrusters, and magnetic torquers. Advanced attitude determination methods. Course may be offered in classroom-based or online format. 3 lectures. Formerly AERO 460.

AERO 5568 Aerospace Research and Development I (3 units)
Term Typically Offered: TBD
Prerequisite: Graduate standing in Aerospace Engineering, AERO 306, or AERO 3305.

Immersive team-based approach to an aerospace research and development cycle. Theoretical work, preliminary design, and prototype manufacture. Advanced test and analysis techniques. Validation of numerical work using test techniques. Field trip may be required. 1 lecture, 2 laboratories. Formerly AERO 568.

AERO 5569 Aerospace Research and Development II (3 units)
Term Typically Offered: SP
Prerequisite: AERO 568 or AERO 5568.

Continuation of Aerospace Research and Development I. Design optimization cycle. Numerical and experimental experimentation, high-fidelity validation and correlation of testing data, and archival-quality technical reporting of engineering data and analysis. Field trip may be required. 1 lecture, 2 laboratories. Formerly AERO 569.

AERO 5570 Special Advanced Topics (3 units)
Term Typically Offered: TBD
Prerequisite: Graduate standing in Aerospace Engineering and consent of instructor.

Directed group study of special topics for graduate students. The Class Schedule will list topic selected. Repeatable up to 6 units. Course may be offered in classroom-based or online format. 3 lectures. Formerly AERO 570.

AERO 5571 Special Advanced Laboratory (1-3 units)
Term Typically Offered: TBD
Prerequisite: Graduate standing in Aerospace Engineering and consent of instructor.

Directed group laboratory study of special topics for advanced students. The Class Schedule will list topic selected. Repeatable up to 6 units. 1 to 3 laboratories. Formerly AERO 571.

AERO 5599 Thesis (1-6 units)
Term Typically Offered: F, SP, SU
Prerequisite: Graduate standing in Aerospace Engineering and consent of instructor.

Each individual will be assigned a project for solution under faculty supervision as a requirement for the master's degree, culminating in a written report/thesis. Repeatable up to 6 units. Formerly AERO 599.