

Aerospace Engineering (AERO)

AERO 201 Aerospace Flight Vehicles 3 Credits (3,0)

History of atmospheric and exoatmospheric flight; aerodynamic properties; fluid conservation equations; dimensional analysis; airfoil shapes; propulsion systems; performance of airplanes and rockets; supersonic and hypersonic flight.

Prerequisites: ENGR 115 and ESCI 201

Course Offered at: Daytona Beach

AERO 210 Air Vehicle Performance 1 Credit (1,0)

Aircraft performance; power- and thrust-producing propulsion systems; propeller characteristics; climb rate, angle, range, and endurance; best climb and endurance parameters; accelerated maneuvers.

Prerequisites: ENGR 115 and ESCI 201

Course Offered at: Daytona Beach

AERO 299 Special Topics in Aerospace Engineering 1-6 Credit (1-6,0)

Individual, independent or directed studies of selected topics in aerospace engineering.

Course Offered at: Daytona Beach, Prescott

AERO 301 Aerodynamics I 3 Credits (3,0)

Incompressible and compressible one-dimensional flow; airspeed measurement; potential flow; lift theory; viscous flow; boundary layers; finite wing theory; drag in incompressible flow; wing-body interactions.

Prerequisites: AE/ME students must have a C or better in ESCI 206 and MATH 243

Course Offered at: Prescott

AERO 302 Aerodynamics II 3 Credits (3,0)

Compressible flow; supersonic flow; shock waves; expansion fans; thermodynamics of gas flow; laminar and turbulent boundary layers; skin friction drag; boundary layer equations.

Prerequisites: AE/ME students must have a C or better in ESCI 206 and ESCI 208

Course Offered at: Prescott

AERO 307 Incompressible Aerodynamics 3 Credits (3,0)

Conservation equations; fluid dynamic principles; inviscid incompressible flows; airfoil and wing flow predictions; viscous flows; turbulence; Navier-Stokes equations; boundary layers.

Prerequisites: AERO 201 and ESCI 204 and MATH 345

Course Offered at: Daytona Beach

AERO 308 Compressible Aerodynamics 3 Credits (3,0)

Thermodynamics; compressibility; shock waves; flow with heat addition and friction; Raleigh-Fanno curves; nozzle flow; supersonic airfoil flow; hypersonic flow elements; method of characteristics; unsteady flow.

Prerequisites: AERO 201 and ESCI 208

Course Offered at: Daytona Beach

AERO 309 Aerodynamic Performance of Flight Vehicles 3 Credits (3,0)

History of atmospheric flight; fluid flow concepts; airfoil and wing aerodynamics; propulsion; airplane performance; stability and control.

Prerequisites: ENGR 115 and ESCI 208 and COMM 221 and ESCI 204

Course Offered at: Worldwide, Asia

AERO 313 Space Mechanics 3 Credits (3,0)

Two-body problem; position and time solutions; Kepler's equations; orbit analysis; ground tracks; orbit transfer; interplanetary trajectories; interception and rendezvous.

Daytona Beach Prerequisites: ENGR 115 and ESCI 204

Prescott Prerequisites: AE/ME students must have a C or better in ENGR 115 and ESCI 204

Course Offered at: Daytona Beach, Prescott

AERO 314 Experimental Aerodynamics 1 Credit (1,0)

Wind tunnel design; instrumentation; scaling effects; data acquisition and reduction; experimental practices.

Daytona Beach Prerequisites: COMM 221 and ((AERO 307 and AERO 308) or AERO 319 or AERO 301)

Prescott Prerequisites: AE/ME students must have a C or better in COMM 221 and ((AERO 307 and AERO 308) or AERO 319 or AERO 301)

Corequisites: AERO 314L

Course Offered at: Daytona Beach, Prescott

AERO 314L Experimental Aerodynamics Laboratory 1 Credit (0,3)

Experiments demonstrating aerodynamic theory; experimental techniques; report writing; experiment design; specific experiments vary by apparatus availability and instructor preference.

Daytona Beach Prerequisites: COMM 221 and ((AERO 307 and AERO 308) or AERO 319 or AERO 301)

Prescott Prerequisites: AE/ME students must have a C or better in COMM 221 and ((AERO 307 and AERO 308) or AERO 319 or AERO 301)

Corequisites: AERO 314

Course Offered at: Daytona Beach, Prescott

AERO 316 Aerospace Engineering Materials 3 Credits (3,0)

Structure, properties, and processing of engineering materials; crystal structure; strengthening mechanisms; mechanical properties; material failures; phase transformations; ferrous and nonferrous materials; ceramics; polymers; composites; aerospace materials and processes.

Prerequisites: ESCI 202 and CHEM 110 and CHEM 110L

Course Offered at: Daytona Beach

AERO 317 Aircraft Flight Mechanics and Performance 3 Credits (3,0)

Aircraft aerodynamics, performance, and static stability; aircraft environment; viscous and compressible aerodynamics; static stability derivatives; performance parameters using EXCEL; group work on aerodynamic and performance analysis; comparison to published data.

Prerequisites: AE/ME students must have a C or better in ESCI 201

Corequisites: ESCI 206

Course Offered at: Prescott

AERO 318 Aerospace Structures I 3 Credits (3,0)

Stress analysis of statically determinate lightweight structures; space and semimonocoque structures; thermal stresses; 3D beam bending; shear flow; finite element modeling; computer-aided analysis.

Daytona Beach Prerequisites: ESCI 202

Prescott Prerequisites: AE/ME students must have a C or better in ESCI 202

Course Offered at: Daytona Beach, Prescott

AERO 319 Aerodynamics for Engineers 3 Credits (3,0)

Fluid dynamic principles; inviscid incompressible flows; airfoil and wing flows; viscous flow and turbulence; thermodynamics; compressible flow; shock waves; expansion waves; nozzle flow; supersonic flow.

Prerequisites: AERO 201 and ESCI 208

Course Offered at: Daytona Beach

AERO 323 Spacecraft Systems 3 Credits (3,0)

Spacecraft design and implementation; systems engineering principles; power, telemetry, communications, thermal control, attitude determination and control, mechanisms, navigation, life support systems, integration, testing, operations.

Prerequisites: AE/ME students must have a C or better in AERO 201

Course Offered at: Daytona Beach

AERO 324 Experimental Space Systems Engineering 2 Credits (2,0)

Subsystems of spacecraft; experimental methods; data acquisition and reduction.

Prerequisites: AERO 313

Corequisites: ELEC 335 and ELEC 335L and AERO 324L

Course Offered at: Prescott

AERO 324L Experimental Space Systems Engineering Laboratory 1 Credit (0,3)

Subsystems of spacecraft; propulsion, attitude control, power, telemetry, communications, structures, materials, thermal control, mass properties.

Prerequisites: AERO 313

Corequisites: ELEC 335 and ELEC 335L and AERO 324

Course Offered at: Prescott

AERO 350 Project Engineering 3 Credits (3,0)

Role of engineer in project management; systematic evaluation of project benefits and costs; proposal preparation; engineering contracts; negotiation techniques; value engineering.

Prerequisites: Junior Standing

Course Offered at: Daytona Beach, Prescott

AERO 399 Special Topics in Aerospace Engineering 1-6 Credit (1-6,0)

Individual, independent or directed studies of selected topics in aerospace engineering.

Course Offered at: Daytona Beach, Prescott, Worldwide

AERO 401 Advanced Aerodynamics I 3 Credits (3,0)

Advanced incompressible aerodynamics; fluid flow dynamics; body flow; shock tube flow; thin airfoil theory; finite wing theory; numerical methods; introduction to compressible flow.

Prerequisites: AE/ME students must have a C or better in AERO 302 and MATH 441

Course Offered at: Prescott

AERO 403 Jet Propulsion 3 Credits (3,0)

Introduction to jet propulsion and gas turbine engines; control volumes; conservation equations; combustion processes; efficiencies; fuel consumption; ideal and real ramjets; engine cycles; diffuser and nozzle flows; preliminary component analysis.

Prerequisites: AERO 307 and AERO 308

Course Offered at: Daytona Beach

AERO 405 Introduction to Finite Element Analysis 3 Credits (3,0)

Mathematics of classical finite element analysis; static structural, modal, and thermal analysis. Application of high-end computer-aided engineering software such as ANSYS. Reinforcement of computational methods through practical testing; homework and engineering projects used for evaluation.

Prerequisites: ESCI 202 and ESCI 208 and (ENGR 200 or ENGR 201)

Course Offered at: Prescott

AERO 409 Aircraft Composite Structures 3 Credits (3,1.5)

Introduction to reinforced plastic composite structural materials; material properties; testing procedures; design and analysis using classical lamination theory; fabrication techniques; hands-on demonstrations.

Daytona Beach Prerequisites: ESCI 202 and AERO 316

Course Offered at: Daytona Beach, Prescott

AERO 411 Advanced Experimental Aerodynamics 3 Credits (2,3)

Advanced wind tunnel experiments; model design and construction; control surface testing; propeller testing; wind tunnel data use; supersonic testing introduction.

Prerequisites: AE/ME students must have a C or better in AERO 314

Course Offered at: Prescott

AERO 413 Airplane Stability and Control 3 Credits (3,0)

Development of longitudinal, lateral, and directional stability and control equations; control surface design; control effectiveness and size requirements; dynamic control theory; handling characteristics and maneuvering stability of aircraft.

Daytona Beach Prerequisites: AERO 307

Prescott Prerequisites: AE/ME students must have a C or better in AERO 307

Course Offered at: Daytona Beach, Prescott

AERO 414 Space Propulsion 3 Credits (3,0)

Principles of liquid and solid propulsion systems; flight performance parameters for single and multistage vehicles; thermochemistry of combustion processes; performance enhancements for nuclear rockets and electric propulsion.

Daytona Beach Prerequisites: AERO 319 or AERO 308

Prescott Prerequisites: AE/ME students must have a C or better in ESCI 206 and (AERO 302 or MECH 360)

Course Offered at: Daytona Beach, Prescott

AERO 415 In-Flight Laboratory 3 Credits (2,3)

Longitudinal and lateral-directional stability; dynamic stability; excess power; rate of climb; turn rate; load factor performance theory; laboratory concept validation.

Daytona Beach Prerequisites: AERO 413

Prescott Prerequisites: AERO 423

Course Offered at: Daytona Beach, Prescott

AERO 416 Aerospace Structures and Instrumentation 1 Credit (1,0)

Lecture-based course supporting the Structures and Instrumentation Laboratory. Emphasizes aerospace vehicle testing; instrumentation; data acquisition; data reduction. Test plans and design utilized.

Daytona Beach Prerequisites: AERO 316 and COMM 221 and (ELEC 327 and ELEC 327L) or (ELEC 335 and ELEC 335L)

Prescott Prerequisites: AE/ME students must have C or better in AERO 316 and COMM 221 and (ELEC 327 and ELEC 327L) or (ELEC 335 and ELEC 335L)

Corequisites: AERO 416L

Course Offered at: Daytona Beach, Prescott

AERO 416L Aerospace Structures and Instrumentation Laboratory 1 Credit (0,3)

Principles of modern aerospace vehicle testing and instrumentation; basic electrical measurements; devices such as strain gages, piezoelectric sensors, thermocouples; measurement of fluid pressure and flow; temperature; thermal and transport properties; strain; motion; vibration; force; torque; experimental static and dynamic analysis of structures; data processing and analysis; report writing and presentation.

Prerequisites: AERO 316 and COMM 221 and (ELEC 327 and ELEC 327L) or (ELEC 335 and ELEC 335L)

Corequisites: AERO 416

Course Offered at: Daytona Beach, Prescott

AERO 418 Aerospace Structures II 3 Credits (3,0)

Deflection and stress analysis of determinate and indeterminate aerospace structures under axial, bending, and torsion loads; work and energy principles; non-idealized structures; idealized semi-monocoque structures; plate buckling; finite element modeling and computer-aided analysis.

Daytona Beach Prerequisites: AERO 318

Prescott Prerequisites: AE/ME students must have a C or better in AERO 318

Course Offered at: Daytona Beach, Prescott

AERO 419 Fundamentals of Wind Energy 3 Credits (3,0)

Introduction to the generation of electricity using wind power; wind characteristics; wind turbine design; aerodynamics of horizontal axis wind turbines; blade element theory; blade optimization; turbine control; electrical and structural characteristics; fatigue; economics; group design and manufacture of a miniature computer-controlled wind turbine.

Prerequisites: AE/ME students must have a C or better in AERO 301

Course Offered at: Prescott

AERO 420 Aircraft Preliminary Design 4 Credits (3,3)

Conceptual and preliminary design of an aircraft; conceptual sizing; configuration studies; performance specifications; aerodynamic calculations; internal arrangement; weight and balance; stability and control predictions; structural sizing and layout.

Daytona Beach Prerequisites: AERO 314 and AERO 314L and AERO 413 and AERO 403 and COMM 219

Prescott Prerequisites: AE/ME students must have C or better in (ENGR 200 or ENGR 201) and at least 2 of the following AERO 423 and (AERO 314 and AERO 314L) and MECH 360

Prescott Corequisites: ENGR 310 and COMM 420

Course Offered at: Daytona Beach, Prescott

AERO 421 Aircraft Detail Design 4 Credits (3,3)

Detailed design of aircraft, including component part or test article design; design from general layout to detail parts and necessary tools.

Daytona Beach Prerequisites: AERO 316 and AERO 418 and AERO 420

Prescott Prerequisites: AE/ME students must have a C or better in AERO 420 and AERO 318 and ENGR 310

Prescott Corequisites: COMM 430

Course Offered at: Daytona Beach, Prescott

AERO 423 Airplane Stability, Dynamics, and Control 3 Credits (3,0)

Static and dynamic aircraft stability; airplane control; aircraft equations of motion; stability derivatives; static stability criteria; dynamic modes of motion; aircraft responses; civil-military regulations; control surface design; control effectiveness and size requirements; handling qualities; airplane control theory; open and closed loop feedback; group projects with real examples and data for aircraft detailed design.

Prerequisites: AE/ME students must have a C or better in AERO 301 and AERO 317 and ESCI 204 and MATH 345

Course Offered at: Prescott

AERO 426 Spacecraft Attitude Dynamics 3 Credits (3,0)

Fundamentals of spacecraft attitude dynamics; attitude parameterization; determination; space disturbances; stability analysis; numerical simulations; control methods for spacecraft attitude during space missions.

Daytona Beach Prerequisites: AERO 313 and (MATH 392 or MATH 441)

Prescott Prerequisites: AE/ME students must have a C or better in AERO 313

Course Offered at: Daytona Beach, Prescott

AERO 427 Spacecraft Preliminary Design 4 Credits (3,3)

Application of spacecraft preliminary design principles; meeting mission objectives; design of complete space-related system to industry preliminary design standards; design package including objectives, requirements, specifications, CAD drawings, weight and subsystem budgets, trade studies, design reviews, and reports.

Daytona Beach Prerequisites: AERO 314 and AERO 314L and AERO 414 and AERO 426 and COMM 219 and (AERO 323 or (AERO 307 and AERO 308))

Prescott Prerequisites: AE/ME students must have C or better in ENGP 312 and (ENGR 200 or ENGR 201)

Prescott Corequisites: AERO 426 and COMM 420 and COMM 430

Course Offered at: Daytona Beach, Prescott

AERO 428 Advanced Space Mechanics 3 Credits (3,0)

Advanced topics in Celestial Mechanics with emphasis on Astrodynamics; theoretical, computational, and physical understanding of modern spacecraft dynamics; investigation of Relative Two-Body Problem; inertial and non-inertial coordinate systems; time-dependent and time-independent Lambert's Problem; Linear Orbit Theory; Three-Body Problem and N-Body Problem solutions.

Prerequisites: AERO 313

Course Offered at: Prescott

AERO 429 Space Environmental Applications 3 Credits (3,0)

Fundamentals of the space environment, scientific applications, and heat transfer as applied to spacecraft; atmosphere; gravity gradients; radiation; introduction to plasma physics; planetary surface operations; spacecraft operations effects.

Prerequisites: ELEC 327 and ELEC 327L

Course Offered at: Daytona Beach

AERO 430 Control System Analysis and Design 3 Credits (3,0)

Modeling, analysis, and control of dynamical systems; transfer functions; block diagram algebra; Routh-Hurwitz stability criteria; system design using root locus, Bode plots, and Nyquist diagrams.

Prescott Prerequisites: AE/ME students must have a C or better in ESCI 204 and MATH 345

Worldwide Prerequisites: ESCI 204 and MATH 345

Course Offered at: Prescott, Worldwide

AERO 432 Flight Dynamics and Control 3 Credits (3,0)

Aircraft equations of motion; state variable representation; longitudinal and lateral motion; aircraft response to atmospheric inputs; automatic control theory; classical and modern control theory application to aircraft autopilot design.

Prerequisites: AERO 413

Course Offered at: Daytona Beach

AERO 433 Aerodynamics of the Helicopter 3 Credits (3,0)

Offered on Development of rotating-wing aircraft and helicopters; hovering theory; vertical flight performance analysis; autorotation; blade motion and control; aerodynamics and performance of forward flight; blade stall; stability and vibration problems; design problems.

Prerequisites: AE/ME students must have a C or better in AERO 301

Course Offered at: Prescott

AERO 434 Spacecraft Control 3 Credits (3,0)

Review of spacecraft equations of motion; state variable representation; automatic control theory; classical and modern control approaches; attitude control with thrusters, reaction wheels, spin; control during thrust maneuvers; translational motion control.

Prerequisites: AERO 426 and (MATH 392 or MATH 441)

Course Offered at: Daytona Beach

AERO 435 Jet Propulsion Preliminary Design 4 Credits (3,3)

Preliminary design of a jet engine for aircraft propulsion; complete engine design; proposed engine layout; cycle calculations; installed performance; engine sizing; requirement satisfaction calculations.

Prerequisites: COMM 219 and AERO 403

Course Offered at: Daytona Beach

AERO 437 Advanced Space Propulsion 3 Credits (3,0)

Offered on Covers exotic propulsion concepts beyond typical liquid, hybrid, solid, and electric propulsion systems; advanced concepts to orbit and deep space travel; topics include fusion propulsion, Bussard ramjets, matter-antimatter propulsion, antigravity, space drives, warp drives, and faster-than-light travel.

Prerequisites: AE/ME students must have a C or better in AERO 414 or MECH 360

Course Offered at: Prescott

AERO 440 Jet Propulsion Detail Design 4 Credits (3,3)

Design of jet engine components; general layout; team design of major components including inlet, fan, compressor, combustor, turbine, nozzle, support systems; integration to verify component functionality.

Prerequisites: AERO 435

Course Offered at: Daytona Beach

AERO 441 Rocket Propulsion Preliminary Design 4 Credits (3,3)

Preliminary design principles for rocket engines; complete rocket engine system design; specifications, calculations, CAD drawings, weight, and subsystem budgets; trade-off studies, reviews, and design reports.

Prerequisites: AERO 314 and AERO 314L and AERO 414 and COMM 219

Corequisites: AERO 323

Course Offered at: Daytona Beach

AERO 442 Experimental Dynamics and Control 1 Credit (1,0)

Linear control; open and closed loop feedback analysis; system modeling and linearization; parameter system identification and validation; state space representation; block diagrams; feedback and transfer functions; control design based on transient and steady-state specifications; stability criteria; dynamical system control analysis in time and frequency domains.

Prerequisites: COMM 221 and AERO 432 or AERO 434

Corequisites: AERO 442L

Course Offered at: Daytona Beach

AERO 442L Experimental Dynamics and Control Laboratory 1 Credit (0,3)

Laboratory for dynamical systems and control; dynamical systems testing; instrumentation; amplifiers; analog-to-digital converters; Boolean algebra; logic gates; microprocessors; data acquisition and analysis; dynamics modeling for flexible link and rotational systems; experimental determination of natural frequency; control design and implementation; system response analysis; report writing and data presentation.

Prerequisites: COMM 221 and AERO 432 or AERO 434

Corequisites: AERO 442

Course Offered at: Daytona Beach

AERO 445 Spacecraft Detail Design 4 Credits (3,3)

Detail design of a space-related system; general layout; team design of major components; CAD drawings; subsystem integration; design verification.

Daytona Beach Prerequisites: AERO 318 and AERO 427 and AERO 434

Prescott Prerequisites: AE/ME students must have a C or better in AERO 427 and AERO 318 and AERO 324 and AERO 324L and AERO 426 and CESC 325 and CESC 325L

Course Offered at: Daytona Beach, Prescott

AERO 451 Rocket Propulsion Detail Design 4 Credits (3,3)

Principles of rocket engine detail and subsystem design; analysis; modeling; manufacture; test; integration of multiple subsystems into a single functional model.

Prerequisites: AERO 318 and AERO 441

Course Offered at: Daytona Beach

AERO 455 Computational Aerodynamics 3 Credits (2,1)

Computational fluid dynamics for aerodynamics; governing and model equations for fluid and heat flow; finite-difference approximation; numerical discretization; stability analysis; explicit and implicit methods; practical CFD modeling for aerodynamics; grid generation; visualization techniques.

Prerequisites: AERO 307 and AERO 308

Course Offered at: Daytona Beach

AERO 499 Special Topics in Aerospace Engineering 1-6 Credit (1-6,0)

Individual, independent or directed studies of selected topics in aerospace engineering.

Course Offered at: Daytona Beach, Prescott