# AEROSPACE ENGINEERING (AERSP)

AERSP 504: Aerodynamics of V/STOL Aircraft

3 Credits

Jet wings, high lift devices, propellers and ducted propellers, circulation and boundary layer control, unsteady airfoil theory.

**Prerequisite:** AERSP407

AERSP 505: Aero- and Hydroelasticity

3 Credits

Interaction of elastic systems having several degrees of freedom with fluid flows in various configurations.

AERSP 506: Rotorcraft Dynamics

3 Credits

Modeling and analysis techniques for dynamic response, vibration, aeroelastic stability, and aeromechanical stability of rotary-wing vehicles.

**Prerequisite:** AERSP504 , E MCH571

AERSP 507: Theory and Design of Turbomachinery

3 Credits

Theory and principles of machinery design: compressors, turbines, pumps, and rotating propulsors; opportunity to work out design examples.

AERSP 508: Foundations of Fluid Mechanics

3 Credits

Mathematical review, fluid properties, kinematics, conservation laws, constitutive relations, similarity principles, the boundary layer, inviscid flow, vorticity dynamics, wave motion.

AERSP 509: Dynamics of Ideal Fluids

3 Credits

Irrotational flow theory, two-dimensional and axisymmetric flows, airfoil theory, complex variables, unsteady phenomena; flow with vorticity, finite wing theory.

**Prerequisite:** AERSP508

AERSP 511: Aerodynamically Induced Noise

3 Credits

Review of fluid mechanics. General theory of aerodynamic sound. Noise radiation from jets, boundary layers, rotors and fans. Structural response.

AERSP 514: Stability of Laminar Flows

3 Credits

The stability of laminar motions in various geometries as influenced by boundary conditions and body forces of various kinds.

AERSP 518: Dynamics and Control of Aerospace Vehicles

3 Credits

Dynamical problems of aircraft and missiles, including launch, trajectory, optimization, orbiting, reentry, stability and control, and automatic control.

**Prerequisite:** AERSP413 or AERSP450

AERSP 524: Turbulence and Applications to CFD: DNS and LES

3 Credits

First of two courses: Scalings, decompositions, turbulence equations; scale representations, Direct and Large-Eddy Simulation modeling; pseudo-spectral methods; 3 computer projects.

**Prerequisite:** AERSP508 or M E 521
Cross-listed with: ME 524

AERSP 525: Turbulence and Applications to CFD: RANS

3 Credits

Second in two courses: Scalings, decomposition, turbulence equations; Reynolds Averaged Navier Stokes (RANS) modeling; phenomenological models; 3 computer projects.

**Prerequisite:** AERSP508 or M E 521
Cross-listed with: ME 525

AERSP 530: Aerothermochemistry of Advanced Propulsion Systems

3 Credits

Physics and chemistry needed to analyze high performance rocket propulsion systems including reacting high temperature radiating gas and plasma flows.

**Prerequisite:** AERSP312 or M E 420

AERSP 535: Physics of Gases

3 Credits

An introduction to kinetic theory, statistical mechanics, quantum mechanics, atomic and molecular structure, chemical thermodynamics, and chemical kinetics of gases.

Cross-listed with: ME 535

AERSP 540: Theory of Plasma Waves

3 Credits

Solutions of the Boltzmann equation; waves in bounded and unbounded plasmas; radiation and scattering from plasmas.

**Prerequisite:** E E 471
Cross-listed with: NUCE 540

AERSP 550: Astrodynamics

3 Credits

Applications of classical celestial mechanics to space flight planning. Determination and construction of orbital parameters by approximation methods. Perturbation techniques. AERSP 550 Astrodynamics (3) This course covers the mathematics and practices in orbital mechanics as applied to space mission analysis, design and operation. The major topics are: the n-body problem, the two-body problem, Keplerian orbits, the Kepler problem (position as a function of time), three-dimensional specifications of Keplerian orbits (orbital elements), Lambert's problem (determining the trajectory between two specified points with a given time of flight), impulsive transfers, the Hohmann transfer and its extension to other problems, the sphere of influence, the patched-conic approximation, the restricted three-body problem, linear orbit theory (relative motion between vehicles in neighboring orbits), gravitational modeling, perturbation methods (Encke's method and variation of elements), orbit determination, tracking kinematics, and time systems.

**Prerequisite:** AERSP450 or E MCH409 or PHYS 419

AERSP 560: Finite Element Method in Fluid Mechanics and Heat Transfer

3 Credits

Application of finite element techniques to viscous/unsteady fluid flow/ heat transfer problems.

**Prerequisite:** AERSP312 , AERSP313

AERSP 571: Foundations of Structural Dynamics and Vibration

3 Credits

Modeling approaches and analysis methods of structural dynamics and vibration.

**Prerequisite:** AERSP304 , E MCH470 , M E 450 , or M E 570
Cross-listed with: EMCH 571, ME 571

AERSP 583: Wind Turbine Aerodynamics

3 Credits

Analysis of wind turbine performance, aeroacoustics, and loads; turbine selection for site-specific application.

AERSP 590: Colloquium

1-3 Credits/Maximum of 3

Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers.

AERSP 596: Individual Studies

1-9 Credits/Maximum of 9

Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.

AERSP 597: Special Topics

1-9 Credits/Maximum of 9

Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or term.

AERSP 597A: **SPECIAL TOPICS**

3 Credits

AERSP 597F: **SPECIAL TOPICS**

3 Credits

Cross-Listed

AERSP 597J: **SPECIAL TOPICS**

3 Credits

AERSP 600: Thesis Research

1-15 Credits/Maximum of 999

No description.

AERSP 601: Ph.D. Dissertation Full-Time

0 Credits/Maximum of 999

No description.

AERSP 602: Supervised Experience in College Teaching

1-3 Credits/Maximum of 6

Provides an opportunity for supervised and graded teaching experience in aerospace engineering courses.

AERSP 610: Thesis Research Off Campus

1-15 Credits/Maximum of 999

No description.

AERSP 611: Ph.D. Dissertation Part-Time

0 Credits/Maximum of 999

No description.

AERSP 880: Wind Turbine Systems

3 Credits

Wind turbine technology and the critical elements of turbine systems design.

AERSP 886: Engineering of Wind Project Development

3 Credits

An overview of the wind project development process and technical considerations for onshore and offshore applications.