

**The University of Texas at El Paso
College of Engineering
Department of Mechanical Engineering
Syllabus**

Course Prefix and Number: AERO 3312

Course Title: Aerodynamics I

Credit Hours: 3

Prerequisite Courses:

MECH 2311: Introduction to Thermo-Fluid Science with C or better

Course Description:

This course builds on the student's background in Fluid Mechanics to deal primarily with flows (low-speed and high-speed) relevant to aerospace applications, with particular emphasis on components related to an airplane. Both inviscid and viscous flows will be considered in the analysis of airfoils, wings, nozzles, and diffusers.

Learning Outcomes:

- Formulate and apply and apply conservation equations to predict forces and performance of airfoils (lift and drag)
- Perform analysis of flow for wings, nozzles, and diffusers
- Compute the change in pressure, temperature, and density across shock and expansion waves
- Compute aircraft velocity using pressure measurements from a Pitot tube

Required Materials: All required materials will be provided

Course Schedule:

Weeks 1-2	Introduction	Dimensional analysis, lift, drag, vector operations, conservation equations (mass, momentum, and energy)
Weeks 3-4	Inviscid Flows	Bernoulli's equation, sources, sinks, vortex, lift past a circular cylinder
Weeks 5-6	Incompressible Flows	Viscous flows, boundary layer flows, laminar and turbulent flows, airfoil theory (symmetric and cambered),
Weeks 7-8	Wing Theory	Induced drag, Helmholtz Theorems, Prandtl's lifting-line theory
Weeks 9-11	Compressible Flows	Thermodynamics review, compressibility equations, normal shock, oblique shock, and expansion waves
Weeks 12-13	External Flows	Flow over wedges and cones, shock interactions, Prandtl-Meyer expansion waves, flow through nozzles and diffusers
Weeks 14-15	Experimental Techniques	Flow visualization (Schlieren, shadowgraph), wind tunnel, pitot-tube, pressure distribution around a circular cylinder, introduction to propulsion systems of airplanes