

CALIFORNIA STATE UNIVERSITY, CHICO  
 Department of Mechanical Engineering, Mechatronic Engineering, & Manufacturing Technology

## MECH 435 – Low Speed Aerodynamics (3 units)

2008 Spring Semester

**Scheduled Course Meeting Times:** Lecture/Discussion T R 12:30 pm – 1:45 pm YOLO 146  
 (Spring 2008 Class No. 3896)

**Prerequisites:** CIVL 321 (formerly CE 150) – Fluid Mechanics, MATH 260 (formerly Math 7D) – Differential Equations

**Instructor:** Jim Tan-atichat

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**Office Hours:** Monday 11:00 am – 11:50 am  
 (Tentative) Wednesday 2:00 pm – 3:50 pm  
 Thursday 3:00 pm – 4:50 pm  
 (Please check office door card for the latest revision to the times shown above.  
 Other times by appointment)

**Course Objective:** To provide students with a basic knowledge of concepts needed to understand and analyze fluid flows around elementary body shapes, thin airfoils, and wings of finite span.

**Text:** Anderson, Jr., J. D., *Fundamentals of Aerodynamics*, Fourth Edition, McGraw-Hill Higher Education, New York, NY, Copyright © 2007, ISBN-10 0-07-295046-3

### Some Useful Reference Periodicals:

- *AIAA Journal*
- *Journal of Aircraft*
- *Journal of Fluid Mechanics*
- *Journal of Fluids Engineering*

<b>Grading Basis:</b>	<u>Component(s)</u>	<u>Approx. Weight</u>
	Homework Exercises	5% ~ 10%
	Midterm Examination	20% ~ 15%
	Literature Review Reports & Presentations	25%
	Project(s)	30% ~ 20%
	Final Examination/Project	20% ~ 30%

## **Tentative Topics to be covered:**

### *Background Review:*

- Review of fluid properties
- Fluid statics
- The Standard Atmosphere
- Fundamentals of fluid mechanics
  - conservation laws
  - const. property flows
  - Mach and Reynolds numbers as similarity parameters
  - Boundary layer concept
  - Bernoulli equation

### *Aerodynamics:*

- Dynamics of an incompressible, inviscid flow field
  - Air speed determination (via Bernoulli equation)
  - Pressure coefficient
  - Circulation, Irrotational flow, stream function concepts
  - Elementary flows (uniform, source/sink, potential vortex, doublet, etc.)
  - Superposition of elementary flows
  - Lift/drag coefficients as flow-field parameters
  - Flow around a cylinder (with and without circulation)
- Incompressible, viscous boundary layers
  - Governing equations and boundary conditions
  - Incompressible laminar and turbulent boundary layers
- Characteristic parameters for airfoil and wing aerodynamics
- Two-dimensional incompressible flow around thin airfoils
- Incompressible flow about wings of finite span
- Aerodynamic design considerations