Course Information

Course time/location Spring 2019

Tuesday/ Thursday 3:30-5:15 pm

EPIC 204

No class February 19th (Monday schedule)

Last day of class May 2nd.

February 26th - last day to drop without W.

April 5th - last day to drop with W.

Textbooks

Required:

J. Anderson, *Fundamentals of Aerodynamics,* 5th Ed. McGraw-Hill. (You don't need the supplement unless you will take ME425 in the fall next year.)

Reference:

I. Abbott and A. von Doenhoff, *Theory of wing sections*, Dover.

J. J. Bertin and M. L. Smith , *Aerodynamics for Engineers*, Prentice Hall.

A. M. Kuethe and C.-Y. Chow, *Foundations of Aerodynamics*, McGraw-Hill.

J. Katz and A. Plotkin, *Low Speed Aerodynamics*, McGraw-Hill.

Lecture Requirements

- attend and partiicpate
- bring calculator
- bring notebook

Topics

Review of fluids topics (2.3-2.10)

Streamline, vorticity circulation (2.11-2.13)

Stream and potential functions (2.14-2.15)

Bernoulli equation, pressure coefficient (3.2-3.5)

Elementary potential flows, Kutta Joukowski Theorem, Lift (3.6-3.18)

Airfoil nomenclature, Kutta condition, Kelvin Theorem (4.1 -4.6)

Thin airfoil theory (4.7-4.13)

High aspect ratio wing, Prandtl lifting line (5.1-5.5)

Linearized compressible flow (11.1-11.7)

Boundary layers, drag (Chap 17 & 18)

Course objectives and assessment method

Primary:

* Students will gain the ability to analyze and solve problems pertaining to the aerodynamics of aircraft.
Homework assignments, Laboratories, Computer Projects, Exam

* The students will be proficient at using the differential approach to solving exterior inviscid and basic viscous fluid mechanics problems.
Homework assignments, Exam

Secondary:

* Students will be able to present complete solutions to technical problems following an acceptable engineering format.
Homeworks, project reports, laboratory reports.

* Students will learn to see equations as representations of physical phenomenon and learn how previous mathematics courses are useful when studying an engineering topic.
Quizzes, in class active learning projects

* Students will become proficient with specific computer tools for obtaining and presenting solutions.

Homeworks requiring extensive use of MATLAB.

* Students will gain experience with computational solution methods for exterior fluid mechanics.

Computer projects. *XFOIL, Tornado*

Computer Usage and Projects

This course will be highly dependent on computer usage.

- Many homework assignments will require MATLAB (symbolic manipulation as well as regular programming)
- Two open source codes will be utilized to analyze airfoil aerodynamics (XFOIL) and wing aerodynamics (Tornado)

Laboratories

The students must perform at least two labs during the course of the semester

- Wind tunnel measurements of lift and drag characteristics for a cylinder (using pressure distribution)
- Wind tunnel measurements of the pressure distribution around wing sections, leading to calculation of lift and drag

The laboratory write-ups are graded not only for their technical accuracy, but also for their quality of technical writing, proper grammar and correct spelling. Good writing is an essential part of an engineering career and this is as good a time as any to try to master it.

A third lab in which the students explore the behavior of a force-balance system may be conducted.

Approximate Grading Scale

5% Homework

25% Computer projects

20% Laboratories

25% Midterm

25% Final