ENGR 4390.001 Special Topics: Introduction to Aircraft Aerodynamics and Performance Fall 2013
Section 0.001: 10:00-10:50 MWF, EN 108

Instructor: Dr. David Bridges, Associate Professor of Mechanical Engineering
Office: EN217A, x2181, email david.bridges@tamucc.edu
Office Hours: 3-5 p.m. TTH, others by appointment or as available

Course Description (future catalog): 3 sem. hrs. (3:0). Forces on aircraft; standard atmosphere; steady-state cruise, climb, and turn performance; performance optimization; introduction to aircraft longitudinal stability.

Course Description (narrative): In this course, students will learn the basics of aircraft performance. They will learn how to analyze the forces on an aircraft to arrive at expressions for performance (what can the aircraft do?) and performance optimization (what is the best it can do?). Students will examine steady-state aircraft range, endurance, climb, and turns, and will be introduced to the longitudinal stability of aircraft.

Course Learning Objectives: Upon completing this course, students will be able to

a. Demonstrate a basic understanding of the forces that act on an aircraft (a, b)
b. Demonstrate the ability to compute performance parameters for an aircraft (a, e, k)
c. Demonstrate the ability to obtain expressions for optimal performance parameters for an aircraft (a, e, k, l)
d. Demonstrate a basic understanding of aircraft longitudinal stability (a, e)
e. Demonstrate an improvement in their ability to read and interpret a technical document and to communicate their understanding to others (g, i)

(letters in parentheses refer to student outcomes for mechanical engineering)

Course Outline/Schedule (tentative, subject to change):

11 lectures: Introduction to aircraft geometry and nomenclature; airfoils and wings
Lift, drag, thrust, and weight
Standard atmosphere
Aerodynamics of the airplane – lift and drag coefficients and the drag polar
Thrust and power – jet engines and piston engine / propeller power
Equations of motion; steady level flight; thrust required
(Textbook sections 1.1 through 5.3)

Test #1 On or about 2 Oct 2013

12 lectures: Aircraft performance in steady flight
Thrust available and max speed
Gliding flight
Steady-state climbing flight
Range and endurance
(Textbook sections 5.4 through 5.16)
Aircraft performance in accelerated flight
steady, level turns
(Textbook sections 6.1, 6.2)

Test #2 On or about 1 Nov 2013

12 lectures: Introduction to aircraft longitudinal stability (handouts)

Test #3 On or about 4 Dec 2013

3 lectures: Energy methods; load factors and the V-n diagram (Textbook sections 6.5, 6.6)

Final 8:00 am, Wednesday, 18 Dec 2013
Grading:  Three one-hour tests will be given on dates announced at least two class periods in advance. These tests will make up 65% of the final course grade. Homework (which will include a few reading/writing assignments) and computer assignments will make up 15% of the final course grade, and a three-hour comprehensive final will make up 20% of the course grade. The homework and computer assignments will have different weights corresponding to the size of each assignment. Grades will be assigned on a 10-point scale: 90-100=A, 80-89=B, 70-79=C, 60-69=D, below 60=F.

Absences:  Tests missed as a result of unexcused absences will result in a score of zero. Under most circumstances, the final exam grade will be substituted for tests missed due to excused absences. The absence must be excused in advance except in case of extreme emergency. No makeup exams will be given, except under unusual circumstances and entirely at the discretion of the instructor.

Communications:  All outside-of-class communications will be conducted through the message and e-mail functions of the Blackboard site for the class. Each student should make sure his or her preferred e-mail address is the one in the Blackboard system, and each student should check e-mail and the Blackboard message site regularly.

Computer:  Some of the homework assignments will involve the use of MATLAB™, a UNIX-based mathematical toolkit. Tutorial / review sessions instructing students in the basics of MATLAB™ will be scheduled early in the semester.

Academic Honesty:  Academic honesty is expected at all times. Occurrences of cheating will be dealt with according to university regulations regarding academic misconduct.