M&AE 5070 – Dynamics of Flight Vehicles

Course Syllabus

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This course provides an introduction to the engineering science of flight dynamics – the response of flight vehicles to external perturbing forces and control inputs. After a review of aerodynamic principles and the concepts of static longitudinal and lateral/directional stability, the equations of motion for a rigid airplane are developed. Motions of aircraft having bi-lateral symmetry are considered, both as linear problems involving small perturbations from equilibrium (straight and level) flight, and for non-linear problems involving larger departures from equilibrium.

The numerical software package MATLAB will be used extensively, both for the analysis of linear systems and for integration of the complete, nonlinear equations of motion.

Prerequisites include M&AE 3230 and M&AE 3050, or their equivalents, and M&AE 3260 (at least concurrently).

Text:
    Introduction to Aircraft Stability and Control
    by *David A. Caughey*

Grading:

Homework:		20%
Quizzes:	(2 @10% each)	20%
Mid-term:	March 16	25%
Final Exam:	May 11	35%
Total		**100%**

Tentative Lecture Schedule:

Lectures	Topic	Text
24 Jan – 28 Jan	Introduction, Atmospheric Properties, and Aerodynamics	Chapter 2
31 Jan – 18 Feb	Static Stability and Control	Chapter 3
21 Feb – 7 Mar	Dynamical Equations for Flight Vehicles	Chapter 4
18 Mar – 30 Mar	Review of Systems Dynamics	Section 5.1
1 Apr – 6 Apr	Longitudinal Dynamics	Section 5.2
8 Apr – 11 Apr	Lateral/Directional Dynamics	Section 5.3
13 Apr – 6 May	Control of Aircraft Motions	Chapter 6

Class will consist of Lectures on Mondays, Wednesdays and Fridays from 11:15 am – 12:05 pm in Upson 205. Lectures and course material will be based on Prof. Caughey's lecture notes, which are available in .pdf format on the course web site. Course material is determined by what is covered in lecture, and students are responsible for all material discussed in class, whether covered in the lecture notes or not.

There will be 7 or 8 homework sets assigned during the semester. You may discuss general approaches to homework problems with others, but the work you hand in must be your own. Homework sets typically are due in class one week after being assigned; solutions will be posted on the web immediately after class on the due date, so late homework will not be accepted.

Mid-term examination will be in class on Wednesday, March 16, from 11:15 am – 12:05 pm. Final examination will be on Wednesday, May 11, from 7:00 - 9:30 pm. There will also be (probably) two, 30-minute, in-class quizzes; dates for these quizzes will be announced (in class and on the web) at least one week in advance.

Course information is available at: *http://courses.cit.cornell.edu/mae5070*