

THE UNIVERSITY OF TEXAS AT AUSTIN
Department of Aerospace Engineering and Engineering Mechanics

ASE 367K FLIGHT DYNAMICS
FALL 2024

SYLLABUS

Unique Number: 14305

Lecture Time & Location: TTH | 09:30-11:00 | CMA 2.306

Instructor: John-Paul Clarke | ASE 3.222 | (512) 471-4371 | johnpaul@utexas.edu

Teaching Assistant: Edward Jung | edward.jung@austin.utexas.edu

Tutorial Time & Location: W | 15:00-17:00 | ASE 3.204

Web Page: UT Austin Canvas site for ASE 367K (<https://courses.utexas.edu>)

Catalog Description: Equations of motion for rigid aircraft; aircraft performance, weight and balance, static stability and control, and dynamic stability; design implications.

Course Objectives: This course is intended to give the student an understanding of the basic principles of airplane flight mechanics. A major portion of the time is spent in discussing flight stability and control.

Prerequisites: ASE 320 Low Speed Aerodynamics

Knowledge, Skills, and Abilities Students Should Have Before Entering This Course:

Students should have adequate knowledge in Calculous, Differential equations, Vector analysis, and Dynamics and be able to formulate basic forces acting on particles from fundamental physics. Basic understanding of how aerodynamic force is produced by airfoils and wings is essential. Some ability to write down equations of motion from inspection of dynamics problems is assumed. Some ability to write and solve ordinary differential equations is assumed.

Knowledge, Skills, and Abilities Students Gain from this Course (Learning Outcomes):

Students taking this course will gain ability to: derive equations of motion of an aircraft in various flight configurations; model aerodynamic forces and moments experienced by subsonic airplanes (under incompressible and compressible flow conditions); understand the derivation and use of formulas for range factor, range, rate of climb, time to climb, neutral point, dynamic response and stability, etc.

Impact on Subsequent Courses in Curriculum:

This course is a prerequisite for the capstone airplane design course. It is motivated by a discussion of the commercial and military mission profiles for airplane sizing, and a major part of the course is devoted to the derivation of the equations to be used in each mission segment for the calculation of distance, time and fuel. Hence, once the conceptual design has been performed and the configuration of an airplane is known, the student should be able to carry out the sizing activity.

Relationship of Course to Program Outcomes and ABET Program Criteria Achieved:

(<https://utexas.box.com/v/asecoe-abet-criteria>)

Academic Topics: Introduction, Math Preliminaries, Point Mass Dynamics, Aerodynamics of Airplane Configurations, Cruising Flight Performance, Gliding, Climbing, and Turning Performance, Nonlinear, 6-DOF Equations of Motion, Aircraft Control Devices and Systems, Linearized Equations of Motion, Longitudinal Dynamics, Lateral-Directional Dynamics, Analysis of Linear Systems, Flying Qualities Criteria

Professionalism Topics: None.

Design Assignments: None.

Laboratory Assignments: None.

Computer: PC or Mac / Matlab or another equivalent software tool for Homework Problems and Term Project.

Textbook: Bernard Etkin and Lloyd Duff Reid, *Dynamics of Flight: Stability and Control: 3rd Edition*, Wiley, 2010

Class Format: In-Person Classes - Designed with the assumption that all students will attend the class in person and is thus more interactive in nature. Material in these classes will be presented synchronously.

Class Outline: See Topics.

Key Class Dates:	First Class	TUE	27-AUG		
	No Class	TUE	26-NOV (Thanksgiving Break)		
	No Class	THU	28-NOV (Thanksgiving Break)		
	Last Class	THU	05-DEC		
Due Dates, Times, and Contribution to Grade:	HW 1	FRI	06-SEP	23:59	7.5%
	HW 2	FRI	13-SEP	23:59	7.5%
	HW 3	FRI	20-SEP	23:59	7.5%
	HW 4	FRI	27-SEP	23:59	7.5%
	Exam 1	TUE	01-OCT	09:30	10.0%
	HW 5	FRI	18-OCT	23:59	7.5%
	HW 6	FRI	25-OCT	23:59	7.5%
	HW 7	FRI	01-NOV	23:59	7.5%
	HW 8	FRI	08-NOV	23:59	7.5%
	Exam 2	TUE	12-NOV	09:30	10.0%
	Term Project	FRI	06-DEC	23:59	20.0%

Homework Policy: Homework will be posted in the class Canvas website and due electronically on Canvas by the posted due date and time. Submitted homework should be legible, complete, and professional. Working together on assignments is permitted; however, every student must turn in their own original work. Late assignments will ONLY be accepted if an extension is requested a priori due to the observance of a religious holy day. By UT Austin policy you must notify the instructor at least fourteen days prior to the date of observance of a religious holy day that will cause you to miss a homework submission.

Examinations: The exams during the term (01-OCT and 12-NOV) will take approximately one hour and 15 minutes and occur during the lecture period on the respective days. There will be NO final exam.

Term Project: The term project will be due at 23:59 on the last Friday of the term (06-DEC).

Attendance: Regular attendance is expected. Medical and professional (e.g., job interview) absences may be excused with proper documentation on a case-by-case basis at the sole discretion of the instructor. Contact the instructor if you have any questions about absences. The student should always notify the instructor of any planned absences before that class if at all possible. By UT Austin policy you must notify the instructor of your pending absence at least fourteen days prior to the date of observance of a religious holy day.

Class Recordings: Class recordings (if made) are reserved only for students in this class for educational purposes and are protected under FERPA. The recordings should not be shared outside the class in any form. Violation of this restriction by a student could lead to Student Misconduct proceedings.

Sharing of Course Materials is Prohibited: No materials used in this class, including, but not limited to, lecture hand-outs, videos, assessments (quizzes, exams, papers, projects, homework assignments), in-class materials, review sheets, and additional problem sets, may be shared online or with anyone outside of the class unless you have my explicit, written permission. Unauthorized sharing of materials promotes cheating. It is a violation of the University's Student Honor Code and an act of academic dishonesty. I am well aware of the sites used for sharing materials, and any materials found online that are associated with you, or any suspected unauthorized sharing of materials, will be reported to Student Conduct and Academic Integrity in the Office of the Dean of Students. These reports can result in sanctions, including failure in the course.

Grading: The plus/minus grading system will be applied (Canvas default grading scheme). Any issue a student encounters with regards to tests/homework grading must be reported in writing within one week of the date the test/homework was made available for pick up and/or the grades posted. The student must email the instructor within one week with a PDF document attached containing a typed letter stating the issues uncovered and including any supporting evidence. The instructor will evaluate the request and issue a response within a week of the reception of the letter. The instructor reserves the right to re-evaluate the test and its grade in their entirety and not to solely re-evaluate the portions of the test outlined in the student's letter.

Evaluation: Note that the Measurement and Evaluation Center forms for the Cockrell School of Engineering will be used to evaluate the course and the instructor. They will be conducted in an electronic format.

DISABILITY & ACCESS (D&A):

The University of Texas at Austin is committed to creating an accessible and inclusive learning environment consistent with university policy and federal and state law. Please let me know if you experience any barriers to learning so I can work with you to ensure you have equal opportunity to participate fully in this course. If you are a student with a disability, or think you may have a disability, and need accommodations please contact Disability & Access (D&A). Please refer to the D&A website for more information: <http://diversity.utexas.edu/disability/>. If you are already registered with D&A, please deliver your Accommodation Letter to me as early as possible in the semester so we can discuss your approved accommodations and needs in this course.

University Resources

For a list of university resources that may be helpful to you as you engage with and navigate your courses and the university, see the [University Resources Students Canvas page](#)

Prepared by: John-Paul Clarke

Date: 26-AUG-2024