

EAS 4400 : Stability and Control of Aircraft

Class Periods: M,W,F 3rd period (0935-1025)

Location: MAE-A 0303

Academic Term: Spring 2025

Instructor

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Office Hours in NEB 427 : M,W (1040-1130)

Teaching Assistants

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Office Hours in NEB 526 : M,W (1355-1550)

Course Description

(3 credits) Static stability and control, equations of motion, stability derivatives, stability of longitudinal and lateral motion of aircraft

Course Pre-requisites

EAS 4101 and EML 4312

Course Objectives

This course will demonstrate the principles that govern aircraft. You will learn issues associated with flight dynamics such as nonlinear and linear equations of motion, static and dynamic stability, longitudinal and lateral-directional modes, and aircraft responses to excitation. You will learn to relate systems concepts, such as transfer functions and state-space representations, to these flight dynamics. Most importantly, you will learn how to apply and utilize the fundamental theories from previous courses to evaluate novel configurations of aircraft.

Materials and Supply Fees

This course does not have any fees.

Relation to Program Outcomes (ABET)

	Outcome	Coverage
(1)	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	HIGH
(2)	an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	LOW
(3)	an ability to communicate effectively with a range of audiences	LOW
(4)	an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	
(5)	an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	
(6)	an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	MEDIUM
(7)	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies	LOW

Required Textbooks and Software

This course does not have a required textbook.

Recommended Materials

- Thomas Yechout, Steven Morris, David Bossert and Wayne Hallgren, “*Introduction to Aircraft Flight Dynamics*,” AIAA, 2002, ISBN 1-56347-577-4.
- Jitendra R. Raol and Jatinder Singh, “*Flight Mechanics Modeling and Analysis*,” CRC Press, 2023, ISBN-978-1-003293514.
- Ranjan Vepa, “*Flight Dynamics, Simulation and Control*,” CRC Press, 2023, ISBN 9781003266310.

Required Computer

- Recommended Computer Specifications: <https://it.ufl.edu/get-help/student-computer-recommendations/>
- HWCOE Computer Requirements: <https://www.eng.ufl.edu/students/advising/fall-semester-checklist/computer-requirements/>

Course Schedule

The first part of the course will cover flight dynamics by introducing concepts of nonlinear and linear equations of motion, static and dynamic stability, longitudinal and lateral-directional modes and aircraft responses to excitation. The second part of the course will cover systems analysis by introducing concepts of transfer functions, state-space models, and flight controls.

Reading Schedule

The course does not have required reading assignments; however, reading from the Recommended Materials can be very beneficial. Selected pages from the Recommended Materials are identified that correlate to topics in the lectures. These pages will not replace the lecture content but rather will augment the lecture content.

Dates	Topic	Yechout	Raol	Vepa
Sep 05 - Sep 22	static stability	173-195 202-220		
Oct 06 - Oct 22	linear systems	239-246	180-181	137-163
Oct 24 - Oct 29	longitudinal modes	330-344	182-195	177-186 191-195 201-202 205-206
Oct 31 - Oct 31	longitudinal rate derivatives	259-261	83	119-120
Nov 03 - Nov 05	lateral-directional modes	344-355	195-202	186-191 195-200 203-205 206-207
Nov 07 - Nov 07	lateral-directional rate derivatives	266-279	84	127-128

Attendance and Expectations

Students will need to know the material from each lecture so attendance, while not mandatory, is strongly advised. The entirety of exams and homeworks are constructed based on content and concepts presented in these lectures so you will not be properly prepared if you do not attend class. The lectures and recommended textbooks are meant to present complementary approaches and examples so the textbooks are supplementary to, but not replacements for, the lectures. Also, some lectures may have unannounced in-class quizzes. Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies at <https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies>

Evaluation of Grades

tentative date	event	course value
EXAMS		60%
October 01	exam01	(10%)
October 08	exam02	(25%)
November 19	exam03	(25%)
December 03	exam03	(25%)
HOMEWORK		40%
September 26	homework01	(8%)
September 29	homework02	(7%)
October 27	homework03	(10%)
November 14	homework04	(8%)
November 17	homework05	(7%)

Grading Policy

Grades will be determined based on a curve that reflects the level of difficulty for each homework and exam. This curve is not based on class performance or the student average; instead, the curve is determined before the exam is given based on the amount of partial credit allowed for each solution.

Grade Evaluation

Any exam for which a student wants the grade to be evaluated must be given to the instructor within 48 hours, and before the start of the subsequent lecture, of when the graded exams were available to the class.

Cheating Policy

Exams must strictly reflect your own work so any use of unauthorized materials (other students, notes, phones, computers, books) will be strictly penalized. Cheating on an exam will be reported to the Dean of Students Office with a recommendation of grade of 0 for the entirety of that exam.

Homework Submission

Homework are due by the start of class. Each homework is assigned to have a 1-week deadline; however, the class is given an extension such that the actual due date is the latest possible date before an exam. Due to the already-built-in extension, due dates will not be extended further. Late submissions will not be accepted.

Academic Policies and Resources

<https://go.ufl.edu/syllabuspolicies>

Commitment to a Positive Learning Environment

The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University's core values.

If you feel like your performance in class is being impacted, please contact your instructor or any of the following:

- Your academic advisor or Undergraduate Coordinator
- HWCOE Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
- Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, pld@ufl.edu