EAS 4400 : Stability and Control of Aircraft

Class Periods: M,W,F 3rd period (0935-1025)
Location: FAB 0103
Academic Term: Spring 2024

Instructor
Rick Lind
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Office Hours in 324 MAE-A : M,W (1040-1130)

office will move to NEB
sometime during semester

Teaching Assistants
Raquel Schlicht
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Office Hours on zoom : T,R (11:45-12:35)

Sarah Clees
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Office Hours on zoom : T (0935-1130)

Zoom Information	
Meeting ID :	946 5254 7821
Passcode :	194116

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.

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
Jan 22 - Feb 07	static stability	173-195 202-220		
Mar 28 - Mar 20	linearization	239-246	180-181	137-163
Mar 25 - Mar 27	longitudinal modes	330-344	182-195	177-186 191-195 201-202 205-206
Mar 27 - Mar 29	longitudinal rate derivatives	259-261	83	119-120
Apr 01 - Apr 03	lateral-directional modes	344-355	195-202	186-191 195-200 203-205 206-207
Apr 03 - Apr 05	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%
February 16	exam01	(10%)
February 26	exam02	(25%)
April 17	exam03	(25%)
April 24	exam03	(25%)
	HOMEWORK	40%
February 9	homework01	(8%)
February 12	homework02	(7%)
March 25	homework03	(10%)
April 10	homework04	(8%)
April 12	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. Due dates are not extended. Late submissions will not be accepted.

Students Requiring Accommodations
Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, https://www.dso.ufl.edu/drc) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Course Evaluation
Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at `https://gatorevals.aa.ufl.edu/students`. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via `https://ufl.bluera.com/ufl/`. Summaries of course evaluation results are available to students at `https://gatorevals.aa.ufl.edu/public-results/`.

In-Class Recording
Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A "class lecture" is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To "publish" means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

University Honesty Policy
UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code". On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (`https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/`) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Commitment to a Safe and Inclusive Learning Environment The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture. If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- HWCOE Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Software Use
All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy
There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: `http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html`

Campus Resources

- Health and Wellness
  - **U Matter, We Care**
    Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.
  - **Counseling and Wellness Center**
    http://www.counseling.ufl.edu/cwc, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.
  - **Sexual Assault Recovery Services (SARS)**
    Student Health Care Center, 392-1161.
  - **University Police Department**
    392-1111 (or 9-1-1 for emergencies), or http://www.police.ufl.edu/.
- Academic Resources
  - **E-learning technical support:** 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. https://lss.at.ufl.edu/help.shtml.
  - **Career Resource Center:** Reitz Union, 392-1601. Career assistance and counseling. https://www.crc.ufl.edu/.
  - **Library Support:** http://cms.uflib.ufl.edu/ask. Various ways to receive assistance with respect to using the libraries or finding resources.
  - **Teaching Center:** Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. https://teachingcenter.ufl.
  - **Writing Studio:** 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers. https://writing.ufl.edu/writing-studio/.
  - **Student Complaints Campus:** https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf.
  - **On-Line Students Complaints:** http://www.distance.ufl.edu/student-complaint-process.