

AE 4803 – Introduction to Flight Test Engineering

Course Syllabus

Spring Semester 2023

1. CLASS SCHEDULE

Lecture: TBD

Building TBD

2. INSTRUCTORS

Dr. Jonathan Rogers, Associate Professor, School of Aerospace Engineering, Georgia Institute of Technology

Office: Montgomery Knight 421B

Office Hours: TBD

Phone: (404) 385-1600

Email: jonathan.rogers@ae.gatech.edu

Mr. Chris Maston, Senior Research Engineer, Georgia Tech Research Institute

Office:

Office Hours: TBD

Phone: (404) 823-2677

Email: chris.maston@gtri.gatech.edu

Teaching Assistant: TBD

Office Hours: TBA

Email: @gatech.edu

3. COURSE OVERVIEW

The field of flight test engineering is an exciting multi-disciplinary field of applied engineering that requires a foundation in aeronautics, aircraft and systems, flight operations, and project management. This course will provide the senior undergraduate or graduate student with an overview of flight test engineering topics to include test methodologies, aircraft systems and instrumentation, test planning and reporting, flight data analysis and presentation experiences.

The course will seek to provide theory, case studies and real world examples, direct flight simulator experience, and guided projects in flight data analysis, reporting, and presentation. Students will become familiar with and proficient in flight testing methodologies for evaluating fixed-wing

aircraft performance as well as flying and handling qualities. The course will also touch on analogous methods for rotorcraft and unmanned aerial vehicles.

4. PREREQUISITE COURSES

Prerequisite: AE 3330 Aerospace Vehicle Performance (must be completed prior to taking this course)

Co-Requisite: AE 4531 Aircraft Flight Dynamics (may be taken simultaneously with this course)

5. COURSE TEXTBOOK

The suggested textbook for this course is:

Gregory, J., Liu, Tianshu, Introduction to Flight Testing, Wiley, 1st Edition, 2021, ISBN 978-1-118-94982-6

The above textbook is suggested, but not required, for students to purchase or obtain from the library.

6. COURSE OBJECTIVES

At the end of this course, students will be able to:

1. Describe the importance of flight testing in the aircraft design, development, and life cycle.
2. Understand flight test planning considerations to include: flight operations and safety, data collection, aircraft instrumentation, and airworthiness criteria.
3. Demonstrate the ability to plan an aircraft test point, collect key data, analyze and interpret collected data, report findings and provide future test recommendations.
4. Be proficient in the use of aircraft performance flight test techniques to evaluate pitot-static calibration, take-off and landing data, climb and cruise performance data, turn and stall performance, energy state and maneuverability testing.
5. Demonstrate understanding of flying and handling qualities testing and data collection considerations. Demonstrate knowledge of basic flying and handling qualities testing methods, aircraft configurations, and stability analysis.
6. Apply basic engineering knowledge, team work, project management, reporting and presentation skills.
7. Be able to articulate the ethics, safety, and impact of aircraft test and evaluation activities.

7. GRADING

Grades will be determined based on demonstrated proficiency on projects (approximately 5-6) and a final exam. The points associated with each graded event are shown below along with the associated letter grade. Note that this course is not graded on a curve.

Point Breakout:

Project Sets (5)	= 750 points
Final Exam	= 250 points
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Total	= 1000 points

Class participation: +, 0, -

Grading Scale:

- A = 900-1000 Total Points
- B = 800-899 Total Points
- C = 700-799 Total Points
- D = 600-699 Total Points
- F = 0-599 Total Points

Occasionally, students will be offered the opportunity to obtain extra credit points. These points are added to the student's total while the total points for the course remains at 1000.

In borderline cases, the class participation score will be used to influence the final grade.

8. HOMEWORK SETS

Several projects will be issued during the semester. These projects are intended to deepen understanding of the material. Unless stated otherwise, projects are to be submitted before class begins on the due date. **Projects will not be accepted late.**

Projects must be written in a neat and professional manner. Staple all of your pages together – folded or paper-clipped submissions will NOT be accepted. Projects will be submitted in the specified format provided for each. Digital submissions must accompany any paper submissions. Additionally, several projects may require a presentation of results and findings to help the student practice professional presentation skills. **Failure to comply with ALL of these standards will result in a grade of zero for the entire assignment.**

9. ADDITIONAL INSTRUCTION

Supplemental instruction by the instructor or TA is a valuable resource available to any student having difficulty with a particular concept in the course. Get help when you have a problem! Be prepared to ask specific questions that concisely articulate unclear concepts. **Students are highly encouraged to attend office hours or make an appointment via email.**

10. OTHER CLASS POLICIES

Attendance: Class attendance is required. This class is meant to be fun, informative, not attending limits your opportunity to learn.

Cell Phones and Electronic Devices: Cell phones and computers *should not be out during class*. No exceptions.

Students with disabilities will receive necessary accommodations. For details, please refer to the GT Disabilities Services' "Policies and Procedures" page located at this link: <http://disabilityservices.gatech.edu/content/15/policies-procedures>.

11. ACADEMIC DISHONESTY

Students are expected to uphold high ethical standards including adherence to Georgia Tech Academic Honor Code (which can be found in the course catalog).

You are permitted and to a great extent encouraged to seek the advice of others. However, there is an obvious difference between a constructive discussion about a homework problem with a classmate and copying a classmate's work or code. Copying is not permitted. Any help/advice you receive must be fully documented so that you do not falsely represent yourself and your work.

If you are not sure about whether a particular action could be considered plagiarism or academic dishonesty on your part, then ask the instructor.

12. HEALTH AND WELL-BEING

Georgia Tech and the School of Aerospace Engineering understand that many students experience stress through a variety of academic, financial and personal experiences. We value you and want to make you aware of resources available to you should you need them. Your well-being and mental health are important, and we are here for you.

Center for Assessment, Referral and Education (CARE)	https://care.gatech.edu/
Campus Police (any emergency): 404-894-2500	http://www.police.gatech.edu/
Counseling Center: 404-894-2575	https://counseling.gatech.edu/
Dean of Students Office: 404- 894-6367	https://studentlife.gatech.edu/
Georgia Crisis and Access Line: 800-715-4225	
National Suicide Prevention Lifeline:800-273-TALK (8255)	https://suicidepreventionlifeline.org/
Crisis Text Line: Text HOME to 741741	
VOICE: Victims Survivor Support: (404) 385-4464 (or 4451)	
http://healthinitiatives.gatech.edu/well-being/voice	
Stamps Health Services	https://health.gatech.edu/contact

13. TENTATIVE SCHEDULE

Note the following lessons are tentative and subject to change.

Lessons (tentative)
Course Intro and Overview
Flight Test Importance & Types of Flight Test
Intro to Aircraft Systems and Data
Flight Test Instrumentation
Airworthiness Certification and Testing (military and FAA)
Test Planning Considerations
Flight and Test Operations
Data Analysis Concepts
Test Data Standardization
Pitot-Static Airspeed Calibration
Aircraft Energy Test Methods
Cruise Performance Testing
Take-off and Landing Testing
Turning Flight, Stall Speed Testing, V_{mcg} & V_{mca} considerations
Longitudinal Static and Dynamic Stability Testing
Lateral Directional Static and Dynamic Stability Testing
MIL-STD 1797, FAA Flying Qualities Criterion
Center of Gravity Effects, Spin and Departure Testing
Aircraft Augmented Motion Overview, SAS & Control Systems Review
Handling Qualities Testing Requirements and Planning
Cooper Harper Ratings, Capture Tasks and Handling Qualities Evaluations
Human-System Interface Considerations and Testing
UAS Overview
UAS Testing Considerations