AEE 427: Aircraft Performance and Dynamics
Fall 2015 Syllabus
Monday, Wednesday 2:15-3:35, 373 Link Hall
Friday, 12:45-1:40, 211 Link Hall

Catalog description
Wing aerodynamic, thrust and drag. Performance analysis of aircraft: take-off, landing, climbing, gliding, turns, range and load factors. Control surfaces. Longitudinal and lateral static stability. Dynamic stability. Introduction to autopilot.

Prerequisites: MAE 341, Fluid Mechanics

Instructor:
Prof. Melissa A. Green
253 Link Hall
greenma@syr.edu
@SUProfGreen
Office hours: Tuesday 2-5pm

Teaching Assistant:
Andrew Welles
381A Link Hall – but office hours are in Link+ study area
avwelles@syr.edu
Office hours: Monday & Wednesday 9:00 - 10:30am, Friday 9:30 - 10:30am

Textbooks:
Anderson, Introduction to Flight (any edition)
Nelson, Flight Stability and Automatic Control, Custom version in the bookstore

Wesites:
greenfluids.syr.edu/AEE427.html (docs)
blackboard.syr.edu (grades)
https://piazza.com/syr/fall2015/aee427/home (docs, discussion)

Course Goals:

1. Develop an understanding of the fundamentals pertaining to aircraft performance, such as take-off, climb, range, etc. (student outcomes a, e, l)

2. Develop an understanding of longitudinal and lateral aircraft control and static stability (student outcomes a, e, l)

3. Develop an introductory understanding of dynamic stability and automatic control (student outcomes a, e)

4. Develop an understanding of contemporary issues such as in design, manufacturing, environment, economics, and innovation (student outcome j)

Course learning objective measurement and assessment:

In-class exams	20% (each)
Final exam	20%
Labs	15%
Quizzes	8%
Homework	7%
Blog posts & comments	5%
In-class work	5%

As long as the class average of the final score is above 73%, final grades will be determined by:

	100-93.0	A	92.9-90.0	A-
89.9-87.0	B+	86.9-83.0	B	82.9-80.0	B-
79.9-77.0	C+	76.9-73.0	C	72.9-70.0	C-
69.9-60.0	D	below 60	F		

Lab:
Labs and lab lectures will alternate each week, beginning with lab lecture the first week of class on Friday. The TA will schedule everyone in one-hour lab sessions in groups of 3 or 4, and everyone is required to attend his or her assigned lab session. If you have a one-time conflict with your assigned lab time, contact the TA about making up that particular lab. Each lab will require the submission of both a pre-lab submitted before you complete the lab, and a lab report the following week.

Quizzes:
Quizzes are on Mondays, at the beginning of class. If you have to miss class, contact Prof. Green ahead of time. Top 10 quiz grades will be counted.

Homework:
Homework will be bi-weekly, to be handed in on Wednesdays at the *beginning* of class.

   Late homework is an automatic zero. There are 14 weeks in the semester, meaning 7 homework assignments. I will take your top 5 to calculate your homework grade.

   Homework must be done on green engineering paper, with the problem statement re-written at the top. Each problem starts on a fresh page. If figures are required, they should be done in Matlab, and both the m-file and the plot should be attached (they can be on the same page - the "publish" option). A sample homework page is posted on the website. Even if a large amount of the work is in Matlab, expect to write out the problem by hand and organize your process – give a guideline to what a grader (yours truly) will be seeing in your code.

Piazza & Current events blog:
This term we will be using Piazza for class discussion. The system is catered to getting you help fast and efficiently from classmates, the TA, and myself. Rather than emailing questions to the teaching staff, I encourage you to post your questions on Piazza.
Find our class page at: `https://piazza.com/syr/fall2015/aee427/home`
A class current events blog will be maintained on Piazza. Every two weeks, each student is expected to:

1. Write a 2-paragraph post that links to a current event that relates to the Aerospace industry. Posts should briefly summarize what is happening in the story, and comment on how it connects to what we are learning in class (or might during this semester). You cannot link to a news story that has already appeared in already-published post (read: don't leave it til the last minute!)

   Blog posts will be graded out of 4 pts.

   0: Missing

   1: Incomplete: missing link and/or components of post

   2: Poor: Relevant link, missing component of post, poor quality writing

   3: Sufficient: Relevant link, sufficient length/content, decent quality writing

   4: Good: Relevant link, thoughtful summary and analysis, good quality writing

2. Write an original comment on two distinct posts from other students in the class.

   Posts and comments are due every other Wednesday at 6pm.

   Consider signing up for the AIAA Daily Launch - a good feed of daily Aerospace news in a daily email.

Class participation:
Prof. Green will be using a deck of cards (everyone's name appears once) in order to enhance participation from class. Because the purpose of this class is to integrate many subjects into an understanding of full aircraft dynamics, connections constantly need to be drawn between review material and new material, to help us get a better "feel" for the physics of the problem. Frequent questions to the class, using the cards, is meant to provide feedback as to whether those connections are being made. They're not meant to be evaluative.

If a question is engaged with thoughtfully, the student will get a check mark on the card. At the end of the semester, these check marks will count for a certain fraction of bonus points to the quiz grade. The calibration of checks to bonus points will be based on how many times we make it through the deck.

Learning objectives:
A list of learning objectives have been posted to the class website and Piazza. These are intended to motivate reading assignments and to be used as study guides for exams and quizzes. Since they are numbered, the current progress of the class can be referred to by those numbers.

Final Exam:
Thursday, December 17. 5:15pm-7:15pm

Attendance Policy:

- The University policy on classroom attendance states that "Attendance is expected in all courses at Syracuse University." It is essential that you attend all classes and recitations.

- If you miss classes for illness or other personal reasons, see the Student Records office for an official excused absence.

- The expectation is that you submit an excused absence ahead of the absence in order to make up a quiz, and homework will be expected to be handed in early. The only exception will be made in the case of a medical emergency.

- If you must miss a class or lab for a sporting event, field trip, etc., you MUST submit an absence request that is signed by your coach, advisor, etc. before you miss the class.

Academic integrity:

Syracuse University's Academic Integrity Policy holds students accountable for the integrity of the work they submit. Students should be familiar with the policy and know that it is their responsibility to learn about course-specific expectations, as well as about university policy. The university policy governs appropriate citation and use of sources, the integrity of work submitted in exams and assignments, and the veracity of signatures on attendance sheets and other verification of participation in class activities. The policy also prohibits students from submitting the same written work in more than one class without receiving written authorization in advance from both instructors. The presumptive penalty for a first offense by an undergraduate student is course failure, accompanied by a transcript notation indicating that the failure resulted from a violation of Academic Integrity Policy. The standard sanction for a first offense by a graduate student is suspension or expulsion. For more information and the complete policy, see `http://academicintegrity.syr.edu`.

Related Links:

The Academic Integrity Policy:
`http://academicintegrity.syr.edu/academic-integrity-policy/`
Twenty Questions and Answers about the Academic Integrity Policy:
`http://academicintegrity.syr.edu/faculty-resources/`
What does academic integrity mean?:
`http://academicintegrity.syr.edu/what-does-academic-integrity-mean/`

The College's "Policy on Academic Integrity" applies to this course (as it does to all courses in the College). Specifically:

- There is to be no collaboration on exams or quizzes. Students who either give or get help will receive a grade of zero for the exam, and will be reported to the Academic Integrity Office.

- The homework assignments are to be done separately by each student. While it is permissible to "discuss" problems with other students, copying solutions, Matlab code, calculations, or write-ups will result in a grade of zero for all copied solutions and will be reported to the Academic Integrity Office.

- In written work, text that has been copied from another source must appear in quotes and must include a citation at the end of the sentence. Failure to do so will result in a grade of zero on the assignment and will be reported to the Academic Integrity Office.

Other information:

If you believe that you need accommodations for a disability, please contact the Office of Disability Services (ODS), http://disabilityservices.syr.edu, located at 804 University Avenue room 309, or call 315-443-4498 for an appointment to discuss your needs and the process for requesting accommodations. ODS is responsible for coordinating disability-related accommodations and will issue students with documented disabilities "Accommodation Authorization Letters," as appropriate.

Since accommodations may require early planning and generally are not provided retroactively, please contact ODS as soon as possible.

Tentative schedule:

Week starting	Monday	Wednesday	Friday
8/31	Admin, review of Aero 1 (basic concepts)	Review of Aero 2 (standard atmosphere)	Lab 1a SLUF
9/7	**No class Labor Day**	Review of Aero 3 (airspeed)	Lab 1b
9/14	Review of Aero 4 (finite wings)	Review of Aero 5 (aircraft aero)	Lab 2a Take-off, landing
9/21	Aircraft performace 1 (SLUF, thrust curves)	Aircraft performance 2 (power curves, rate of climb)	Lab 2b
9/28	Aircraft performance 3 (take-off, landing)	Aircraft performance 4 (range, endurance)	**Exam 1** Turn/climb
10/5	Aircraft performance 5 (turns, pull-up, V-n diagrams)	Aircraft stability 1 (pitch stability)	Lab 3a
10/12	Aircraft stability 2 (aircraft moments, trim)	Aircraft stability 3 (other contributions)	Lab 3b
10/19	Aircraft stability 4 (SFNP)	Aircraft stability 5 (directional stability)	Lab 4a Long. stability
10/26	Aircraft stability 6 (roll stability)	Equations of motion 1 (Rigid body dynamics)	Lab 4b
11/2	Equations of motion 2 (Moment of inertia, angular rates)	Equations of motion 3 (Euler angles)	**Exam 2**
11/9	Linearized EoM 1 (small perturbation theory)	Linearized EoM 2 (pure pitching motion)	Lab 5a Lat. stability
11/16	Dynamic stability 1 (dynamic response)	Dynamic stability 2 (longitudinal equations)	Lab 5b
11/23	**No class Winter break**	**No class Winter break**	**No class Winter break**
11/30	Dynamic stability 3 (longitudinal approximations)	Dynamic stability 4 (lateral equations)	Lab 6a Dynamic stability
12/7	Dynamic stability 5 (lateral approximations)	Review	Lab 6b