MAE 3306 – Flight Performance & Stability

Fall 2013

Instructor: Baxter R. Mullins, Jr., Ph.D.

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Office Hours: MW 2:00-3:00 pm

Section Information: MAE 3306-001

Time and Place of Class Meetings: Science Hall (SH) #129, MWF 10:00-10:50 AM

Emergency Exits: Straight out the door, turn right and exit building. If blocked there are exits at end of hallway to the left. **DO NOT USE ELEVATORS**!

Description of Course Content: MAE 3306 FLIGHT PERFORMANCE & STABILITY (3-0) Introduction to aircraft performance and the assessment of aircraft stability and control characteristics. Performance topics covered include cruise, climbing, gliding and turn flights, range and endurance. Stability and controlled topics covered include longitudinal, lateral and directional stability and control.

Student Learning Outcomes: With the successful completion of this course, the student shall have basic understanding of how to develop models for aerospace vehicles, the short falls of such models, and basic understanding of analysis techniques commonly used with emphasis on aircraft performance and static stability.

Required Textbooks and Other Course Materials:

- Mechanics of Flight – 2nd Edition by Warren F. Phillips, John Wiley & Sons, Inc. 2010, ISBN 978-0-470-53975-0
- Software: MATLAB Student Edition by Mathworks Inc.

References:

- Roskam, J. and Lan, C.T.E., "Airplane Aerodynamics and Performance," DARcorporation, First Edition, 1997
- Johnson, W., "Rotorcraft Aeromechanics," Cambridge Aerospace Series No. 36, April 29, 2013, ISBN: 1107028078 (If you like rotorcraft, this is the place to start!)
- Perkins, C. D., and Hage, R. E., "Airplane Performance, Stability and Control," John Wiley & Sons, Inc., 1949
- Etkin, B., "Dynamics of Atmospheric Flight," Dover, September 2005, ISBN 0486445224
- Anderson, J., "Fundamentals of Aerodynamics," 5th ed., McGraw Hill, 2010

- Abbott, I. H., and von Doenhoff, A. E., "Theory of Wing Sections: Including a Summary of Airfoil Data," Dover Publishing Co., 1959
- Pope, A., "Basic Wing and Airfoil Theory," Dover, March 2009, ISBN 0486471888
- Hoerner, S. F., "Fluid Dynamic Lift," Hoerner Fluid Dynamics; 2nd edition (June 1992)
- Hoerner, S. F., "Fluid Dynamic Drag: Practical Information on Aerodynamic Drag and Hydrodynamic Resistance," Hoerner Fluid Dynamics; 2nd edition (June 1965)
- Von Mises, R., "Theory of Flight," Dover Publishing Co., 1959
- Dommasch, D. O., Sherby, S. S., and Connolly, T. F., "Airplane Aerodynamics," Pitman Publishing Corp., New York, 1961
- Gessow, A., and Myers, Jr., G. C., "Aerodynamics of the Helicopter," College Park Press, 1999
- Federal Aviation Regulation: Part 23 & Part 25
- MIL-C-005011B (USAF)
- AS-5263 (USNAVY)

Descriptions of major assignments and examinations:

Exams:

- Two (2) 50 minute exams will be given during the semester
- Comprehensive Final Exam

Project:

- An individual project will be assigned. Assigned projects may vary from student-to-student but be of equivalent status.

Homework:

- Homework will be assigned on a class-by-class basis. Homework will be due one (1) week from the date of assignment at the beginning of the class period. Assignments due on a holiday will be due the next class period. Late assignments will be assessed at least a 10 % penalty.

Other Requirements:

- Prerequisite: MAE 3303 AERODYNAMICS OF COMPRESSIBLE FLOWS
- Modeling software such as MATLAB® and SIMULNK® will be useful in working some homework problems and the project. Student versions are available at the UTA Bookstore. MATLAB® and SIMULNK® are programs commonly used in industries including aerospace companies and learning the use of these programs will enhance your future career no matter your area of work – STUDENT VERSION.
- There is a powerful full-function, free and open source modeling software available from Scilab/Xcos. (See http://www.scilab.org/) This software is used throughout European universities and industries as their standard for engineering and scientific computations.

Attendance: With the exception of Exams, attendance is not mandatory although highly recommended. Makeup Exams are at the discretion of the Instructor within university regulations as described in the current Undergraduate Catalog under Authorized Absences.

Grading:

- Final Grade Weighting:

Homework	10%
Exam 1	20%
Exam 2	20%
Project	25%
Final Exam	25%

- Grade Allocation: Course grades will be assigned

A	90 – 100
B	80 – 89
C	70 – 79
D	60 – 69
F	≤ 59

Students are expected to keep track of their performance throughout the semester and seek guidance from available sources (including the instructor) if their performance drops below satisfactory levels.

Expectations for Out-of-Class Study: Beyond the time required to attend each class meeting, students enrolled MAE 3306, a 3-credit hour course, should expect to spend at least an additional 9 hours per week of their own time in course-related activities, including reading required materials, completing assignments, preparing for exams, etc. (The general rule of thumb is for every credit hour earned, a student should expect to spend 9 hours per week working outside of class.)

Grade Grievances: Any appeal of a grade in this course must follow the procedures and deadlines for grade-related grievances as published in the current undergraduate catalog.

Drop Policy: Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. **Students will not be automatically dropped for non-attendance**. Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (http://wweb.uta.edu/ses/fao).

Americans with Disabilities Act: The University of Texas at Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including the *Americans with Disabilities Act (ADA)*. All instructors at UT Arlington are required by law to provide "reasonable

accommodations" to students with disabilities, so as not to discriminate on the basis of that disability. Any student requiring an accommodation for this course must provide the instructor with official documentation in the form of a letter certified by the staff in the Office for Students with Disabilities, University Hall 102. Only those students who have officially documented a need for an accommodation will have their request honored. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at www.uta.edu/disability or by calling the Office for Students with Disabilities at (817) 272-3364.

Academic Integrity: All students enrolled in this course are expected to adhere to the UT Arlington Honor Code:

I pledge, on my honor, to uphold UT Arlington's tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence.

I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.

Instructors may employ the Honor Code as they see fit in their courses, including (but not limited to) having students acknowledge the honor code as part of an examination or requiring students to incorporate the honor code into any work submitted. Per UT System *Regents' Rule* 50101, §2.2, suspected violations of university's standards for academic integrity (including the Honor Code) will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student's suspension or expulsion from the University.

Student Support Services: UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include tutoring, major-based learning centers, developmental education, advising and mentoring, personal counseling, and federally funded programs. For individualized referrals, students may visit the reception desk at University College (Ransom Hall), call the Maverick Resource Hotline at 817-272-6107, send a message to resources@uta.edu, or view the information at www.uta.edu/resources.

Electronic Communication: UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at http://www.uta.edu/oit/cs/email/mavmail.php.

Student Feedback Survey: At the end of each term, students enrolled in classes categorized as lecture, seminar, or laboratory shall be directed to complete a Student Feedback Survey (SFS). Instructions on how to access the SFS for this course will be sent directly to each student through MavMail approximately 10 days before the end of the term. Each student's feedback enters the SFS database anonymously and is aggregated with that of other students enrolled in the course. UT Arlington's effort to solicit, gather, tabulate, and publish student feedback is required by state law; students are strongly urged to participate. For more information, visit http://www.uta.edu/sfs.

Final Review Week: A period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week *unless specified in the class syllabus*. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.

Course Schedule

Fall Term - Regular Session, 2013 (16 meeting weeks: 15 instructional weeks + 1 final exam week)

First day of classes:	August 23, 2013
Labor Day Holiday:	September 2, 2013
Census Date:	September 9, 2013
Exam # 1	**September 30, 2013**
Last day to drop classes:	October 30, 2013
Project Assignment:	November 6, 2013
Exam #2:	**November 15, 2013**
Thanksgiving Holiday:	November 29, 2013
Project due:	**December 2, 2013**
Final Review:	**December 4, 2013**
Last day of classes:	December 4, 2013
Final Exam for MAE 3405-001	**TBD**

In your course schedule, be sure to indicate (to the extent possible) dates for all major work to be completed. (The definition of "major" is left to the discretion of each instructor.)

"As the instructor for this course, I reserve the right to adjust this schedule in any way that serves the educational needs of the students enrolled in this course. – Baxter R. Mullins, Jr."

Topics covered:

- Airplane Performance
  - The Atmosphere
  - Basic Aerodynamic Principles with Applications
  - Airfoil Theory
  - Wing Theory
  - Airplane Drag
  - Airplane Propulsion Systems
  - Propeller Theory with Applications
  - Fundamentals of Flight Performance

  - Climb and Glide Performance
  - Take-off and Landing
  - Range, Endurance And Payload-Range
  - Maneuvering and Flight Envelope
- Airplane Static Stability
  - Table-Top Models
  - Static Stability and Control
- Every day “Rules of Thumb”