

SYE 3801, Aerodynamics Spring 2015

Instructor: Dr. Thomas Fallon
Email: tfallon@spsu.edu
Phone: 678-915-7431
Class: Q-106, Tuesdays 7:30PM to 10:00PM
Office Hours: Tuesday, 12:15-2:30, 6-7:30PM; Thursday 1:15 to 2:30PM, Q-249

Required Textbook:

Book 1: John Anderson, *Introduction to Flight*, McGraw Hill, 7th Edition, (2011).
ISBN – 13 978-0073380247

Book 2: John Anderson, *Fundamentals of Aerodynamics*, McGraw Hill, 5th Edition,
(2010). ISBN-13: 978-0073398105

Pre-Requisite:

Math 2254 – Calculus 2

Course Description:

The atmosphere, incompressible and compressible one-dimensional flow, Airspeed measurement, Two-dimensional potential flow, Circulation theory of lift, Thin airfoil theory, Viscous flow, boundary layer, finite wing theory, drag in incompressible flow, wing-body interactions, laminar and turbulent flows, transition point, determination of skin friction drag on an airfoil, obtaining equations for streamline, for particle path, and for streakline in a flow field, thermodynamics of gas flow, reversible and irreversible processes, isentropic duct flow and flow through nozzle.

Course Outcomes

Students will be able to:

1. Determine how aerodynamic lift, drag and pitching moment are generated from the pressure and stress distributions on airfoils
2. Apply potential flow theory for basic and combined flows (source, sink, uniform flow, doublet, etc.) and predict the velocity, pressure, and force distributions on aerodynamic bodies
3. Apply thin-airfoil theory and calculate the 2-D incompressible flow over airfoils
4. Compute the induced drag for finite wings and compare the magnitude of the induced drag to that associated with the 2D airfoil.
5. Apply the lifting-line approach for calculating lift and induced drag on thin airfoils
6. Apply simple boundary layer models to evaluate the role of viscous effects on the pressure and shear stress distributions on airfoils

References:

John Bertin, *Aerodynamics for Engineers*, 5th Edition, (2008), Prentice Hall, ISBN-13: 978-0132272681.

E.L. Houghton, *Aerodynamics for Engineering Students*, 5th Edition, (2003), Butterworth-Heinemann, ISBN-13: 978-0750651110.

Grading: There will be no make-up tests. Your grade will be determined as follows:

| | Percentage |
|--------------------------------|------------|
| Homework / Class Participation | 10% |
| Pop Quizzes | 10% |
| Project | 15% |
| Test 1 | 15% |
| Test 2 | 15% |
| Test 3 | 15% |
| Final Exam | 20% |

$A \geq 90$, $80 \leq B < 90$, $70 \leq C < 80$, $60 \leq D < 70$, F else

Final Average = $.10 * Hw + .10 * PQ + .15 * Tx + .15 * Ty + .15 * Tz + .15 * P + .20 * F$

$T_{x,y,z}$ = highest 3 out of 4 test grades

PQ = Pop Quizzes

Hw = Homework

P = Project

F = Final Exam

Professional Behavior and Academic Integrity

All students are expected to abide by the professional and ethical standards established by SPSU. The instructor reserves the right to remove any student from the course if their behavior is of a disruptive and disrespectful nature or if there is evidence of academic dishonesty.

For assignments, take home tests and the project the rules are simple. You are to do your own work. You are not to consult or share work with other students in this class, or in previous classes. You can use any reference books you wish. Ultimately, students are responsible for familiarizing themselves with the SPSU policy on plagiarism and academic honesty.

Reading Assignments: Students are expected to read the text and to remain current with the classroom presentations.

Attendance: Class attendance and discussion is strongly encouraged. Generally students who participate and keep current with the course progress perform better on the exams. Attendance will not be taken in class, except during the first three weeks.

Important Dates:

Monday, January 19th, MLK Jr. Holiday

Thursday, February 19th, Mid-Term Grades Due

Sunday, 3/1 – Saturday, 3/7, Spring Break

Monday, April 27th, Last Day of Classes

Wednesday, 4/29 – Tuesday, 5/5, Final Exams**Disability Statement:**

Students with disabilities who believe that they may need accommodations in this class are encouraged to contact the counselor working with disabilities at [678-915-7244](tel:678-915-7244) as soon as possible to better insure that such accommodations are implemented in a timely fashion.

Tentative Course Schedule:

The following course schedule is tentative. Students are expected to do the reading assignment for each class period **before** coming to class on that day. The assignments listed below are expected to be submitted in class on the due date. Late assignments will not be accepted.

Tentative Textbook Reading Assignments Schedule

| Date | Topic | |
|---------|---|-----------------------------|
| Day 1 | Introduction and Course Administration, Book 1, Chapter 1 | |
| Week 1 | Fundamental Thoughts, Chapter 2 | |
| Week 2 | The Standard Atmosphere, Chapter 3 | Projects Assigned |
| Week 3 | Basic Aerodynamics, Chapter 4 | T1 |
| Week 4 | Basic Aerodynamics, Chapter 4 | |
| Week 5 | Airfoils, Wings, and other Aerodynamic Shapes, Chapter 5 | T2 |
| Week 6 | Airfoils, Wings, and other Aerodynamic Shapes, Chapter 5 | |
| Week 6 | Fluids and Flow, Book 2, Chapter 1 | |
| Week 7 | Fluids and Flow, Book 2, Chapter 1 | Project Progress Report Due |
| Week 8 | Principles and Equations, Chapter 2 | T3 |
| Week 9 | Inviscid, Incompressible flow, Chapter 3 | |
| Week 10 | Inviscid, Incompressible flow, Chapter 3 | |
| Week 11 | Incompressible flow over Airfoils, Chapter 4 | |
| Week 12 | Incompressible flow over Airfoils, Chapter 4 | T4 |
| Week 13 | Incompressible flow over finite wings, Chapter 5 | |
| Week 14 | Three-dimensional incompressible flow, Chapter 6 | |

| | | |
|---------|---|-------------|
| Week 15 | Compressible Flow, Hypersonic Aerodynamics, Chapter 7, 14 | Project Due |
| | | |

Revised 12-22-14

This syllabus/schedule may be changed to suit the needs of the class. Remember your professor wants you to succeed. Let us make it a great semester!