Course Syllabus

Summer 2016 - ME3340 Fluid Mechanics

Professor: Astrid Layton alayton6@gatech.edu

Office Hours: TBD

Course description: The fundamentals of fluid mechanics. Topics include fluid statics; control-volume analysis; the Navier---Stokes equations; similitude; viscous, inviscid and turbulent flows; pipe flow; and external flow.


Grading:

Note: NO quiz (scheduled or unplanned), homework, and/or exam adjustments will be made due to travel arrangements.

1) 20% each - Two Midterm Exams

2) 15% Weekly Quizzes: given at the end of class

   The quiz questions will be based on the material covered in the previous homework assignment and previous week’s class material and examples. If you understood the homework and examples from lecture you will be prepared for the quiz.

   Quizzes will sometimes be given in a group format. Each group will be given a problem to solve. One person from the group will randomly be selected to present the solution on the board. The presented solution will determine the grade for each person in the group.

3) 35% Final Exam

4) 10% Weekly HW Assignments due at the start of class.

   You will receive credit for completed homework, even if the solutions are incorrect, so try everything! I encourage you all to work together on the homework and help each other learn, however, do not copy solutions word for word! Credit will not be given for copied homework. If you work together you must write the solution process and explanation in your own words. Solutions will be posted online after class so you can review the
solutions yourself. **No late homework will be accepted!** There will be a homework due during dead week.

I will drop 1 quiz grade. Late/make-up work WILL NOT BE ACCEPTED unless the student provides a university-excused absence. There are no exceptions to this.

**Curve:** Exams will be curved as needed.

**Final Grades:**
- >= 90 A
- 80-89 B
- 70-79 C
- 60-69 D
- <60 F

**Make-up work:** Make-up of quizzes and/or tests will only be allowed for university excused absences.

**Tentative Course Schedule:** Reading ahead will greatly aid in this course.

<table>
<thead>
<tr>
<th>Dates</th>
<th>Subject</th>
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| Week 1  | Chp 1: Intro to Fluid Mechanics  
          Chp 2: Fluid Statics |
| Week 2  | Chp 2: Fluid Statics  
          Chp 4.3-4.4: Reynolds Transport Theorem  
          Chp 5.1: Control Volume Analysis (Conservation of Mass) |
| Week 3  | Chp 5.1: Control Volume Analysis (Conservation of Mass)  
          Chp 5.2: Control Volume Analysis (Conservation of Linear Momentum) |
| Week 4  | Chp 5.2: Control Volume Analysis (Conservation of Linear Momentum)  
          Chp 5.2: Control Volume Analysis (Conservation of Angular Momentum) |
| Week 5  | Chp 4.1-4.2, 6.1: Fluid Kinematics  
          **Midterm 1**  
          Chp 6.2: Differential Analysis (Conservation of Mass) |
| Week 6  | Chp 6.3: Differential Analysis (Conservation of Momentum)  
          Chp 6.4: Inviscid Flow  
          Chp 3: Bernoulli Equation |
| Week 7  | Chp 6.45-6.5: Potential Flow  
          Chp 6.8-6.9: Differential Analysis (Viscous Flow) |
| Week 8  | Chp 6.9: Viscous flows: Exact Solutions  
          **Midterm 2**  
          Chp 7: Dimensional Analysis & Buckingham Pi |
| Week 9  | Chp 5.3-5.4: Control Volume Analysis (1\textsuperscript{st} and 2\textsuperscript{nd} Laws of Thermodynamics)  
          Chp 8: Pipe Flow |
| Week 10 | Chp 9.1-9.2: External Flows (Boundary Layers)  
          Chp 9.3-9.4: External Flows (Drag and Lift) |
Week 11 | *Chp 9.3-9.4: External Flows (Drag and Lift)*  
Review and Closure

Week 12 | Final Exam

**Re-grading Policy:** If an obvious error is made in grading a test or homework, I will correct it immediately. For all other re-grade requests on tests or quizzes, you must fill out the *Re-grade Request Form* (located on t-square) and turn it in to me along with a photocopy of the entire exam/quiz. All requests must be made by 1 week from the day the test/quiz is handed back in class. After this week period, requests for re-grades will not be granted. The request will be saved in your file until the end of the term. When final grades are computed, I will consider any re-grade requests. If the number of points in question is sufficient to improve your grade, I will evaluate the appeal and re-grade.

**GT Academic Honor Code:** Students are required to follow the Georgia tech honor code which may be found at: [http://www.honor.gatech.edu/plugins/content/index.php?id=9](http://www.honor.gatech.edu/plugins/content/index.php?id=9)

Students are allowed to collaborate on out of class assignments but must include specific attribution to any help they received. Work turned in must be your own work not copied from anywhere else (including solution manuals) and you must state what type of assistance you received while completing the assignment.

**Disabilities:** If you have a disability that requires special testing accommodations or other classroom modifications, you need to notify both the instructor and the Disability Services.

**Dead Week:** As written by GT Policy –

“Courses with a traditional final examination given during finals week are allowed to have homework, projects, and some aspects of major projects due during WPFE [Dead Week].”

“For all courses, homework may be given on new material covered during WPFE if the assignment is indicated on the syllabus at the beginning of the semester.”

**Course Grades:** Final course grades are non-negotiable and are calculated based on the grading scheme outlined in this syllabus.

**Travel Excuses:** NO quiz (scheduled or unplanned), homework, and/or exam adjustments will be made due to travel arrangements.

**Attendance:** Student attendance is important and is directly linked to student achievement in this course.
Course Outcomes:

**Outcome 1**: To develop a student’s understanding of the basic principles of fluid mechanics.

i. The student will demonstrate an ability to recognize the type of fluid flow that is occurring in a particular physical system.

ii. The student will demonstrate an ability to choose the appropriate fluid mechanical principles needed to analyze fluid-flow situations.

**Outcome 2**: To develop a student’s skills in analyzing fluid flows through the proper use of modeling and the application of basic fluid-flow principles.

i. The student will demonstrate an ability to apply appropriate simplifying assumptions and basic fluid-flow principles to formulate a mathematical description of a simple fluid-flow system.

ii. The student will demonstrate an ability to solve and analyze the mathematical equations for a simple fluid-flow system.

**Outcome 3**: To provide the student with some specific knowledge regarding fluid-flow phenomena observed in mechanical engineering systems, such as flow in a pipe, boundary-layer flows, drag, etc.

i. The student will be able to recognize basic flow phenomena that are present in a typical engineering system.

ii. The student will demonstrate knowledge of important practical results in common fluid flows and their physical implications.