Syllabus - CE319F
ELEMENTARY MECHANICS OF FLUIDS

Unique #: 14710
Room ECJ 1.204

Fall 2005
9:45 to 10:45 a.m.

Instructor Information

Professor: Ben R. Hodges, Ph.D.

Office: ECJ 8.208

Office Hours

Tues 12 noon – 1 pm, 3:30 – 4:30 pm

Thurs. 10:45 am – 12 noon

Course web site: https://webspace.utexas.edu/hodgesbr/ce319f/

N.B. you must first login to UT webspace with your UT EID at https://webspace.utexas.edu before you can access the course web site above. The normal UT EID login page *cannot* be substituted for the webspace login. The UT webspace appears to have occasional hiccups and returns "page not found". When this happens, try refreshing your browser several times. Also, the UT webspace addresses are case-sensitive, so you must type the above in lower case letters.

Teaching Assistant: TBD

TA Email: TBD

Exam Schedule

Exam 1 (in class)   Thursday, October 6, 2005;   **9:30** a.m. – 10:45 a.m.
Exam 2 (in class)   Thursday, November 10, 2005; **9:30** a.m. – 10:45 a.m.
Final exam (TBD)   Thursday, December 15, 2005; 9.00 a.m. – 12 noon

The key to success   – DON'T FALL BEHIND –

Class Hours

This is a 3 credit class consisting of lectures and labs. You *must* be signed up for one of the associated lab sessions. There will be 8 lab sessions, each lasting 105 minutes. The labs will meet according to the schedule attached. Laboratory times are valued at ½ lecture time for the purposes of class credits, so this creates a bank of 420 lecture minutes that need to be removed from the standard 75 minute lecture periods. Over the 28 class periods, this amounts to a reduction in class time of 15 minutes per lecture. To account for this time, **lectures will not start until 9:45 a.m.** instead of the standard 9:30 a.m for this class. Note that in-class exams, while designed to be completed in 60 minutes, will start at 9:30 to allow students extra time. For the class period following an exam, I will use the interval from 9:30 to 9:45 to discuss the exam.

I will generally be in class at 9:30 a.m. to discuss homework problems and answer student questions prior to the lecture.

Office Hours (see times above)

I don't keep track of who attends office hours, but historically the students I see in office hours on a regular basis generally obtain a good enough grasp of the material to earn a passing grade. There isn't much I can do for you if you don't understand the material and you wait until the last two weeks of the term before you come see me. You have to build the fundamentals from the start of this class to be able to get through to the end. Office hours are available so that you can get help in understanding the material and the homework problems. However, please don't come to office hours for help on a homework problem until you have made a good attempt at its solution. A key to being a good engineer is being able to solve problems you haven't seen before – you won't learn this skill if you always go for help before you start. I will generally ask to see the work that you have attempted.

The TA (see below) will also have office hours associated with the lab sessions.

I also encourage you to visit me during office hours (or by appointment) for general discussions of fluid mechanics and its relationship to the broader engineering discipline, as well as advising on issues related to engineering education, careers, graduate school and professional societies. I enjoy these discussions and hope I can provide some insight into your profession. However, to be fair to other students, we will suspend more general discussions during office hours when someone has a question about the class material.

Note that in my dual role of teaching and mentoring graduate students, I am typically at the CRWR research laboratory on the JJ Pickle Research Campus on Monday/Wednesday/Friday, and in my UT office on Tuesday/Thursday. I am also teaching class from 2-3:30 on Tuesday/Thursday, and am therefore unavailable during those times. The best times for special appointments outside of office hours are from 11-2 on Tuesday/Thursday, after 4:30 on Tuesday, or after 5:00 on Thursday. Occasionally, I am at UT on Wednesday afternoons. For an appointment outside office hours, please send an email with a suggested time that fits your schedule. Please feel free to contact me via email (see above) at any time. You will get a quicker response if you have CE319F (no spaces) in the email subject line.

Open door policy: I keep my office door open if I am "interruptible." Please feel free to come in and talk to me when my door is open (and I'm not with someone else). However, if my door is closed (or almost closed), please do not interrupt unless your question is both urgent and brief.

Teaching Assistant

This course has both a Teaching Assistant (TA) and a grader. The TA will work with the students in laboratory sessions, and hold office hours to assist students with homework problems. The grader for this course will grade homework assignments and assist with the posting of solutions to the web. Students may not consult with the grader.

There will be several weeks during the semester during which no laboratories will be run (see attached outline). On these weeks, the TA will be available in the laboratory or another office (as announced) for students who have questions or who need assistance on homework problems. In addition, on regular lab weeks, the time remaining in the lab period after lab work has been finished will be available for the students to ask the TA questions about homework problems.

Textbook Information

Yunus A. Cengel and John M. Cimbala, *Fluid Mechanics Fundamentals and Applications*, 1st edition 2006.

This textbook has a website supplied by the publisher that can be accessed at http://www.mhhe.com/engcs/mech/cengel/

This site includes an errata sheet for typographical errors in the book – PLEASE DOWNLOAD!

Pre-requisites

EM 306 (or EM 306S) - Static Mechanics. EM 306 has as pre-requisites M 408D and Physics 303K/103M. Students will be expected to draw on materials from these courses in CE319F.

Course Overview and Objectives

Fluid mechanics is a basic engineering science that should be considered as fundamental for aerospace, chemical, civil, environmental, mechanical, and petroleum engineers. It is essential to understanding phenomena related to the movement and forces established by fluids such as air and water, for designing systems that employ these fluids, and for predicting the transport of pollutants in fluid streams, e.g., rivers, oceans, buildings, the outdoor atmosphere, blood.

The course description from the Undergraduate Catalog is "*Fluid properties, hydrostatics, elements of fluid dynamics, energy and momentum, boundary layers, similitude, pipe flow, metering instruments, drag forces.*" Specific topic areas that will be covered in this course include: properties of fluids, fluid statics, fluids in motion, pressure variations and measurements, conservation of fluid mass, momentum and energy transport, dimensional analysis and similitude, surface resistance, drag and lift, and closed conduit flow.

The intent of this course is to provide an introduction to the field of incompressible fluid mechanics and methods of control volume analysis. Students will become familiar with a breadth of topics related to fluid mechanics, thus allowing for more in-depth analyses in hydraulics and 4th-year elective courses. Students will also become more familiar with the types of problems that involve elementary fluid dynamics, and will be able to identify the intellectual tools (fundamental concepts) that are available to address specific fluid mechanic problems. Many of the tools that students gain from this course will be directly applicable to future problem solving as a practicing engineer.

Homework Policies

Fluids Concepts
Every section in the book has several problems with the suffix 'C' for "conceptual." You should review these questions and understand the concepts in every section covered. **I will be putting one or more of these questions on each exam, and may also use them in the daily quizzes (see below).**

Reading assignments
The course outline includes reading assignments associated with each lecture. As this is a university course, you are expected to *read the assignment before the lecture* and be prepared with questions on the material. I can only teach – learning requires your active participation. Do not expect to simply attend the lectures, do the homework and then ace the tests. On the tests, there will be material from the reading assignments that may not be covered in class. If you do not understand something in the reading assignment, you are expected to ask questions in class!

Homework submittal
Homework is due by 4 p.m. in ECJ 8.6 (CE319F HODGES HW box) on the due dates in the course outline. In general, homework assigned on Tuesday will be due on Friday afternoon, while homework assigned on Thursday will be due the following Tuesday afternoon. This requirement for rapid completion of homework is not just to make your life miserable, but is intended to keep you on track in the material. Most poor grades in this class are a result of students falling behind.

Assigned problems and due dates are listed on the attached CE319F lecture and homework plan. I reserve the right to revise homework assignments and due dates as needed during the semester. To get credit for late homework (before solutions posted – see grading below), the assignment must be placed in the HW box in ECJ 8.6 *and an accompanying email* sent to me (so I can alert the grader). I will *not* accept late homework delivered by hand, in class, under my door, in campus mail, etc. I am noticeably disorganized and scatter-brained, so this policy helps us avoid the plaintive "but I handed it to you last Tuesday, don't you remember?" Note that ECJ 8.6 is only open during the normal M-F workday, so plan your time accordingly.   Once the solutions are posted on the web, homework submissions are covered by the "Resubmission of homework" paragraph below.

Homework format

The format for submitted homework will mimic the expectations of a professional workplace. An engineer's job is not done unless the steps to the solution of a problem are adequately communicated so that someone else can check the work. All homework must be submitted on standard **engineering graph paper** and must be neatly handwritten. All work must be within the margins of the paper, and a 1" margin must be left at the bottom of the page. **Your name shall be in the upper left-hand corner of every page**, along with the homework assignment number and page number. MULTIPLE PAGES OF HOMEWORK MUST BE STAPLED in the upper left-hand corner.

Each homework problem must contain
> 1) **a simplified problem statement (see below)**,
> 2) a sketch of the problem (where applicable),
> 3) labels and definitions for all known and unknown quantities,
> 4) governing equations and any manipulations of governing equations required to get the solution,
> 5) substitution of dimensional quantities (with units) into equations for the final answer.

Homework must be neat. Solutions must be presented in an orderly fashion; anyone should be able to understand your solution six months or six years later! All equations must be written in general symbolic form before specific numerical values are substituted into the equations. All dimensional quantities (in the given information and solution) must have the appropriate units following the numbers through the solution steps. Final answers must be clearly marked (underlined, boxed, or arrowed).

The **simplified problem statemen**t must state the basic problem and what is to be found. It is not necessary to repeat the entire text of the assigned problem, but you must make provide enough information that the reader does not need to refer to the textbook to understand the problem.

N.B. – it is unlikely that you can simply start from a blank piece of paper and produce an acceptably neat and organized homework; plan on starting your homework on scratch paper, then rewriting it in a neat and organized fashion when you have the correct answer. Engineering is more than matching the answer in the back of the book – communication counts!

Homework grading

Homework that is late for any reason will be penalized 50% of the homework grade, provided that it is submitted before the solutions or graded homework are made available to students.

Points will be assigned for each homework problem as follows:
> (a)   +10 points: Clear and complete presentation, correct equations, and correct answer
> (b)   +8 points: Clear and complete presentation, correct equations, incorrect answer due to minor mistake
> (c)   +7 points: Clear and complete, correct approach except major and obvious mistakes
> (d)   +5 points: Clear and complete, but incorrect approach
> (e)   +7 points: **Sloppy presentation** but correct approach, equations and answer
> (f)   +2 points: Sloppy presentation and incorrect approach
> (g)   +0 points: Solution missing

The following penalties will also apply for format infractions:
> (x)   answers not clearly marked - minus 1 point
> (y)   units omitted or incorrect - minus 1 point
> (z)   failure to use engineering paper, writing in the margins, missing problem statement, missing name or page number on one or more pages – minus 1 point

Thus, a homework problem graded with "b y z 6" indicates that there are minor mistakes, units were omitted, and there was a format infraction so only 6 of the possible 10 points are awarded.

Cooperation on homework assignments

Students may work together on homework assignments; however, each student must turn in an original handwritten set of solutions.

Resubmission of homework

In order to encourage students to learn from their mistakes, you may regain up to 50% of the points deducted from a homework solution by resubmitting a newly and **neatly** written version of a homework solution, along with the previous graded solution, within **one week** after the graded homework assignments are returned. It is up to the students to keep track of when resubmissions are due. You only need to redo those problems for which you want the additional credit; i.e. for a set of grades of [6,9,10,4], a total of 29 out of 40, you might want to redo problems 1 and 4 to get back 2 and 3 points respectively. You can certainly redo problem 2 to get back another ½ point, but you might decide it isn't worth the effort.

NOTE – YOU MUST **STAPLE** YOUR ORIGINAL GRADED HOMEWORK TO THE BACK OF THE RESUBMISSION AND WRITE "RESUBMISSION" AT THE TOP OF THE FIRST PAGE. IF YOU DO NOT INCLUDE THE ORIGINAL HOMEWORK SET, IT WILL BE ASSUMED THAT YOU FAILED TO TURN IN THE ORIGINAL HOMEWORK, SO A 50% GRADE IS THE MAXIMUM YOU CAN OBTAIN.

A neatly written original homework set that is completely wrong will often get ~50% credit initially, so a student who turns in all the homework and then does resubmissions can easily end up with a 75% grade on the homework. In effect, getting 75% on homework is a no-brainer. **Resubmissions will not be accepted beyond one week after the initial homework return date.** Once the solutions have been posted, any homework submitted will be considered a "resubmission" for a maximum of 5 points. Further resubmissions of a late homework will not be allowed (so make sure your resubmission is correct!). Late homework cannot be equivalent to an original submission, no matter what the excuse. While this is difficult for students who suffer genuine illnesses, the availability of homework solutions on the web site makes it impossible to consider a late homework on the same grading scale as an original homework. However, late homework *will* be accepted as being equivalent to a "resubmission" (see above) for a maximum of 50% credit. As is the case for homework resubmissions, late homework is accepted up until one week after the graded homework is returned. Students who have extended illnesses that may affect their ability to submit timely assignments should contact me as soon as possible.

Laboratory Sessions and Policy

This course has a laboratory component. The majority of each laboratory session will be devoted to demonstration of some of the principles discussed in class and to worksheet calculations based on the measurements made in the lab.

To balance the sizes of lab sections with TA availability, it may be necessary to assign you to a laboratory time that is different from your original registration. Every reasonable effort will be made to consider your schedule and other commitments if the laboratory times are changed.

You must attend the lab at your assigned time on the weeks of the assigned schedule. This policy keeps the labs sessions balanced. However, you may arrange with another student to swap labs if you have a schedule conflict. It is up to you to find another student to swap labs and to **notify the TA of the arrangement via email.**

If UT-sanctioned extra-curricular activities are taking you out of town such that you would miss your lab, please contact the TA **in the week before you leave** to arrange to attend another lab session. Do not expect to simply show up for another lab and get credit for attending.

There will not be any make-up labs. Note that the penalty for missing labs is quite severe and can easily take you down a grade.

Attendance Policy

Lectures: Attendance is expected. Participation is required. Poor attendance/participation is likely to have an adverse affect on your grade, particularly as related to performance on exams. If you believe you can learn fluid mechanics through a book alone (particularly using osmosis) or the ever-popular "sleep-in-class" learning method, you will find your grade to be significantly lower than average.

Laboratories: Attendance is **required**. Penalties to the final grade will be assigned for each lab that a student fails to attend or lab worksheet that is not submitted as follows:

# labs missed	total grade penalty
1	– 2%
2	– 4%
3	– 10%
4	– 20%
5	automatic failure of CE 319f

For example, if a student finishes this course with a mark of 82% (based upon homework, quizzes and exams), but misses two lab sessions, the final mark for the course will be 78%. If a student fails to complete five or more labs, a failing mark will be assigned in the course.

Exam Policy

There will be two in-class exams given during the semester and a final exam. The second exam will be principally test material covered since the first exam, but may rely on principles that were covered in the material for the first exam. The final exam will be comprehensive. Exam dates and times are listed in the class outline. The exams will be closed book and closed notes. However, each student will be allowed to bring some hand-written notes to the exams. For the first exam, students may bring one sheet of 8.5" x 11" paper, hand-written on both sides. For the second exam, you may bring two sheets of paper written on both sides. For the final exam, you may bring three sheets written on both sides. These sheets MUST be submitted with the exam, and will be returned to students with graded exams (assuming the student puts his/her name on the paper). Conversion factors, physical properties of fluids, and trigonometric formulas will be provided on the exam as needed. You will be required to perform calculus-level mathematics on each exam.

To be fair to all students, especially those with disabilities who may take the test in a separate classroom, the instructor or test proctor will not answer any questions or provide any clarifications during the exams. **Interpreting problem statements is a part of being an engineer and is a legitimate part of the test.** If you believe you need more information to solve a problem, you may assume appropriate values (carefully noting this) and proceed with the solution. N.B. – you shouldn't assume something that makes the problem trivial!

Just prior to the end of an exam, the time remaining on the exam will be announced. You MUST submit your exam paper at the announced end time. The instructor or test proctor will leave the room shortly after the announced end time. Absolutely no exam or exam material will be accepted after the instructor or proctor leaves the room.

Medical illness (or comparable situation such as a death in the family) will be the ONLY excuse for being given an opportunity to complete a make-up exam. In these cases, definitive evidence of circumstance (letter from doctor, etc.) must be provided. If you miss an exam for reasons other than medical illness (or comparable situation) a grade of zero will be assigned to the exam. There will be NO exceptions to this policy. In the past, when make-up exams have been necessary, the student has been required to answer questions and solve problems on a whiteboard in my office.

If, after an exam has been graded and returned, you have questions about the grading of the exam, you must write your questions or comments on a separate sheet of paper and submit these questions/comments to me along with the graded exam. I call this my "anti-whining rule." If you can make a clear and convincing written case for why my grading is unfair, I will be glad to adjust your grade. Exams will be accepted for re-evaluation for up to one week after the exam is returned. There will be no exceptions to this rule. Final exams will not be returned. You may view their final exams with me by appointment at the start of the next term.

Daily Quiz

On most days, I will begin the class with a quick (2-minute) quiz on paper supplied by the student. This quiz may cover material from prior lectures, or material that is in the reading assignment for the present day. The quiz grading scale will be correct/incorrect/late/absent. A correct quiz is worth 3 points, an incorrect quiz is 2 points, late to class is 1 point, and absent is 0 points. In computing the final grade, I drop the lowest two quiz grades (so you get two free absences).

So as an example, if you're present but always wrong, you will earn a 67% on this element of the grade. However, it only takes 6 correct quizzes along with 17 incorrect quizzes and 2 absences to get a 75% grade.

If you're late to class and want the 1 point credit for "late," you must submit a piece of paper **at the end of class** with your name, the date, and "late quiz " on the top. Please do not interrupt the lecture to submit a late quiz.

Grading Policy

Basis of grading in this course:

+	Quiz	5%
+	Homework	20%
+	Exam 1	20%
+	Exam 2	20%
+	Final exam	35%

Letter grades[#] will be assigned as follows:

+	A =	90 – 100%
+	B =	80 – 89.5%
+	C =	70 – 79.5%
+	D =	60 – 69.5%
+	F =	< 60%

* See laboratory sessions and policy for additional requirements.
\# The instructor reserves the right to <u>lower</u> the letter grade cut-offs.

Note – I do not consider this to be a "weed-out" class; i.e. I do not plan on failing any pre-determined fraction of the class. If you have gotten this far in engineering then I believe you have the abilities necessary to be a good engineer. However, having the abilities does not ensure success; you also need motivation and work ethic to succeed. **Be warned:** there is no grading curve in this course and I have no compunction with assigning earned D's or F's. If you *need* a particular grade to stay off probation, stay in engineering, advance to basic sequence, graduate, etc., then be prepared to work for it. I do not give grades – they are earned.

Scholastic Dishonesty Policy

I have very strong beliefs about personal responsibility and the unequivocal requirement for ethical academic behavior. If you are found to engage in unethical behavior related to this course, including the acts of cheating on exams or laboratories, tampering with other student's assignments, plagiarism, etc., you will be penalized in accordance with the severity of the act. Penalties may be as severe as receipt of zero on assignments, labs, or exams, failure of the course, or worse. I will be keeping a photocopy or scanned image of a random sampling of the submitted exams. If you ask for re-grading of an exam question and the exam submitted for re-grading does not match the exam copy I hold, you will be given a failing grade in the course and referred to Office of Student Judicial Services. The official College of Engineering policy is that students who violate University rules on scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and/or dismissal from the University. Since such dishonesty harms the individual, all students, and the integrity of the University, policies on scholastic dishonesty will be strictly enforced. For further information, visit the Student Judicial Services website http://deanofstudents.utexas.edu/sjs/ .

Work hard. Be honest. Learn.

Access to Computers

You must have an email account and access to the university network. You may use your existing account or you may obtain a University email account. I will be communicating via email with the class. The subject line on our electronic communications will always begin with "CE319F", followed by the topic of the email. You are expected to check your email on a regular basis. Please include CE319F on the subject line of any email you initiate – this will ensure you don't get thrown out with the spam.

Additional materials for this course will be provided at the webspace site listed at the top of this syllabus.
Web-based, password-protected class sites will be associated with all academic courses taught at the University. Syllabi, handouts, assignments and other resources are types of information that may be available within these sites. Site activities could include exchanging email, engaging in class discussions and chats, and exchanging files. In addition, electronic class rosters will be a component of the sites. Students who do not want their names included in these electronic class rosters must restrict their directory information in the Office of the Registrar, Main Building, Room 1. For information on restricting directory information, see the Undergraduate Catalog or go to: http://www.utexas.edu/student/registrar/catalogs/gi00-01/app/appc09.html

The Department of Civil Engineering has a microcomputer laboratory, the Learning Resource Center (LRC) on the third floor of ECJ. The LRC is available for you to use. Assistants in the LRC are there to operate the microcomputer laboratory and to respond to specific software and hardware problems. Typically, LRC assistants do not have detailed knowledge of material related to CE319F and should not be consulted on course-specific material.

Your textbook comes with a CD of extra materials, including a engineering problem solver. Some homework problems may require use of materials from this CD.

Course Evaluation

During one of the four final meeting periods at the end of the semester, you will have an opportunity to evaluate this course, myself and TA's using approved MEC forms. These forms will be distributed and collected by a student in the class. I will not be present when the forms are being completed. All students are encouraged to attend and complete the MEC forms**.**

Students with Disabilities

The University of Texas at Austin provides, upon request, appropriate academic adjustments for qualified students with disabilities. Any student with a documented disability (physical or cognitive) who requires academic accommodations should contact the Services for Students with Disabilities area of the Office of the Dean of Students at 471-6259 as soon as possible to request an official letter outlining authorized accommodations. For more information, contact that Office, or TTY at 471-4641, or the College of Engineering Director of Students with Disabilities at 471-4321.

Other Important Dates and Information

College of Engineering policy is that an engineering student must have the Dean's approval to add or drop a course after the fourth class day of the semester or after the second class day of a summer term. Adds and drops are not approved after the fourth class day except for good cause. "Good cause" is interpreted to be documented evidence of an extenuating nonacademic circumstance (such as health or personal problems) that did not exist on or before the fourth class day. Applications for approval to drop a course after the fourth class day should be made in the Office of Student Affairs, Ernest Cockrell, Jr. Hall 2.200.

NATURAL SCIENCES, Physics, Fluid mechanics in general. Mechanics of liquids (hydromechanics). Publisher. John Wiley And Sons Inc. Reviewer: garthus - favoritefavoritefavoritefavoritefavorite - September 17, 2011 Subject: Great book. Good book for elementary students. Gerry. Reviewer: ABHI MECHANICAL - favoritefavoritefavorite - September 17, 2011 Subject: good. §1. Introduction Fluid mechanics concerns the study of the motion of fluids (in general liquids and gases) and the forces acting on them. Like any mathematical model of the real world, fluid mechanics makes some basic assumptions about the materials being studied. These assumptions are turned into equations that must be satisfied if the assumptions are to be held true. Provided that there are no sources or sinks of fluid, the elementary mass of fluid flowing in unit time through an element dš⁰ of the surface bounding W is Ïð̄. dš⁰. By convention dš⁰ is taken along the outward normal, which means that Ïð̄. dš⁰ is positive when the fluid is flowing out of the volume and negative for a flow into the volume W. In a discipline as new and innovative as fluid mechanics, few works remain topical long enough to achieve the status of a classic study. Dr. Hunter Rouse's Elementary Mechanics of Fluids is one of those few. Originally published in 1946. Listen Playing Paused You're listening to a sample of the Audible audio edition. Learn more. See all 2 images.