Spring 2017
CHEN 3200 – Fluids

Instructor: Janet deGrazia
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Class Meeting Times/Dates:
T, Th
Section 1: 10:00 – 11:15 am JSCBB A115
Section 2: 2:30 – 3:45 pm JSCBB A115

Office Hours:
Monday: 4:30 – 6:00 A108
7:00 – 8:00 pm on-line
Tuesday: 4:30 - 6:00 B115
5:15 – 6:30 A108
Thursday: 4:00 – 5:00 B1B90
Friday: 2:30 – 4:00 pm A104

Recitation: Monday: 2:30 – 4:00 pm B115 (optional)

Course Communication:
Desire2Learn will be used for class problems, reading quizzes, grades, online recitations and office hours. You can also access screencasts from there.

Class email:
All emails dealing with class issues should be sent to degrazia@colorado.edu with the subject CHEN 3200. Look before you send an email – can the question be answered on D2L, in the class notes or on the syllabus? Emails concerning class issues that are sent to the instructor without the correct subject line will not be answered in a timely manner.

Pre-requisites:
CHEN 2120 Heat and Material Balances (grade of C or better)
APPM 1350, 1360, 2350 (grade of C- or better)
co–req APPM 2360

Munson, Rothmayer, Okiishi and Huebsch
Course Learning Goals

1. **Fundamentals of Fluid Mechanics**
   - understand characteristics of fluid behavior
   - use force balances to solve basic fluids problems
   - understand units and dimensions
   - understand properties of fluids

2. **Fluid Statics**
   - derive basic equation for a pressure field
   - solve manometry problems
   - analyze hydrostatic forces on different surfaces
   - understand and use buoyancy equations

3. **Fluid Dynamics**
   - derive and understand when to use Bernoulli’s equation
   - interpret velocity and acceleration fields
   - derive and use Reynolds Transport Theorem

4. **Analysis of Fluid Flow**
   - use finite control analysis to apply conservation of mass and Newton’s Second Law to analyze fluid flow
   - use differential analysis to apply conservation of mass to fluid flow
   - understand and apply equations of motion for inviscid and viscous flow

5. **Dimensional analysis**
   - apply Buckingham Pi Theorem to develop dimensionless groups
   - Correlate experimental data with pi terms
   - understand and apply modeling and similitude

6. **Pipe Flow**
   - understand and compare laminar and turbulent flow
   - apply appropriate equations for entrance length/fully developed flow
   - analyze major and minor losses in a pipe
   - calculate parameters such as velocity and pressure drop in pipe systems

7. **Flow over Immersed Bodies**
   - apply lift and drag concepts
   - derive and use boundary layer equations
Problem Solving Method Building:

Engineering is an applied field in which success requires problem solving skills, knowledge of current sources of information, and an understanding of how to use readily available tools. Because of these aspects:

- the amount and type of homework will be thorough enough for students to learn how to solve different types of problems
- screencasts will supplement the assigned homework
- reading quizzes and in-class concept tests will count substantially in your grade
- computer solutions will emphasize readily available spreadsheet methods

The principal concepts that all students must bring with them from their prior education come from mathematics (basic algebra and graphical manipulations, solving sets of linear equations, word problems, and calculus), physics (force balances, statics, conservation of mass), and chemistry (physical properties, use of pressure and volume equations). Students will need to be able to carry out spreadsheet type calculations using Excel™ or other programs - no instruction will be given on their general use.

Class Format:
This class will be taught as a “flipped classroom”. In other words, lecturing will be done outside class through screencasts and reading, while the classroom time will be spent on conceptual questions and problem solving. In order for you to benefit from this approach:

a) Reading assignments and screencasts will be assigned for every class. The class will be conducted with the assumption that you have read/watched them.
b) There will be reading quizzes due at the beginning of each class. These readings will cover the material for that class – the questions generally do not apply to material already covered.
c) Class templates for each class will be posted on-line. Please look through these before class so you are prepared to follow the pace. I will assume that you have done so and will use my class time accordingly.
d) Worksheets will be provided for certain classes. They will be posted on D2L. Please look at the problem before you go to class.
e) Bring your calculator and some method to take notes every class.
**Classroom Atmosphere:**
Students are encouraged to make suggestions regarding improvements in the course as it proceeds. A "safe environment" in which students are free to ask questions or say what is on their mind will be created. Students will be encouraged to get to know one another and will have tremendous opportunities for team building during HW Help sessions.

**Electronic Restrictions:** All cellphones must be powered off and put away before you enter the classroom and not brought out until the class has ended. Anyone who wants to use a laptop computer or tablet in class must obtain prior approval from the instructor. Upon receiving such approval, you must agree to sit in the front and disable the Wi-Fi connection during class.

**Class Notes:**
Much valuable information will be presented during class - fundamental concepts, methods for approaching solutions, example solutions, etc. Students are encouraged to become active class members. Class notes will be posted at the end of each week.

**Academic Dishonesty, Ethics, and Discipline**
Any discovered incidents of academic dishonesty will be reported to the departmental disciplinary committee who will recommend an academic sanction. Sanctions can range from an F for the particular assignment and a lowering of your grade at least a full letter grade to an F for the course. In addition, all confirmed incidents will be reported to the University Honor Code where further disciplinary action can be taken. Group activities in which a student asks another student for a helpful suggestion will not constitute such an incident. However, using someone else's work, or allowing another student to use your work will be considered a dishonest act. When in doubt, ASK!!!
The following list includes some of the examples of acts (not all of them) for which a hearing will result:

1. Using someone else’s clicker or allowing someone else to use yours
2. Talking to each other during a class individual exam
3. Bringing any information into the exams that is not allowed.
4. Plagiarizing solutions to homework such as using solutions from an Official Solutions Manual or pages from an Official Solutions Manual. This includes the Solutions Manual itself or solutions from previous class takers.
5. Any alteration, forgery, or falsification of official records (such as modification of graded homework problems or exams for which you are seeking additional credit)
6. Allowing another person to take an exam for you (false identification)
7. Knowingly providing material of your own or of others to a fellow student.
(7) Possession of or observation of examinations or solutions to examinations prior to the date and time of the exam.
(8) Copying answers from other students during an exam.

Other important information

If you qualify for accommodations because of a disability, please submit to me a letter from Disability Services in a timely manner so that your needs may be addressed. Disability Services determines accommodations based on documented disabilities. Contact: 303-492-8671, Willard 322, and www.Colorado.EDU/disabilityservices.

The University of Colorado at Boulder policy on Discrimination and Harassment (http://www.colorado.edu/policies/discrimination.html), the University of Colorado policy on Sexual Harassment and the University of Colorado policy on Amorous Relationships applies to all students, staff and faculty. Any student, staff or faculty member who believes s/he has been the subject of discrimination or harassment based upon race, color, national origin, sex, age, disability, religion, sexual orientation, or veteran status should contact the Office of Discrimination and Harassment (ODH) at 303-492-2127 or the Office of Judicial Affairs at 303-492-5550. Information about the ODH and the campus resources available to assist individuals regarding discrimination or harassment can be obtained at http://www.colorado.edu/odh.

Students and faculty each have responsibility for maintaining an appropriate learning environment. Students who fail to adhere to such behavioral standards may be subject to discipline. Faculty have the professional responsibility to treat all students with understanding, dignity and respect, to guide classroom discussion and to set reasonable limits on the manner in which they and their students express opinions. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, culture, religion, politics, sexual orientation, gender variance, and nationalities. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. See policies at http://www.colorado.edu/policies/classbehavior.html and at http://www.colorado.edu/studentaffairs/judicialaffairs/code.html#student_c ode.