ChEE 203
Spring 2018
Chemical Engineering Heat Transfer and Fluid Flow
University of Arizona

Instructors:	Dr. Paul Blowers	128 Harshbarger
	Dr. Justine Schluntz	266 Old Engr

Office Hours: See D2L Website

Lecture: TR 11 am – 12:15 pm, Harvill 305

Office Hours: See Website

Course Website: See D2L

Course Preceptors: Ben Barnett
Joseph Chang
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Taylor Hunter
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Instructional manager: Trevor Bradley

Course Description:
Introduction to fluid mechanics and heat transfer applied to chemical engineering.

Text: *Engineering Flow and Heat Exchange,* 3rd Edition, Levenspiel, Springer (2014).

Course Objectives:
Upon completion of this course, students should:
1) be able to solve fluid flow and heat transfer problems that use definitions from physics and build upon principles from ChEE 201.
2) be able to use sheer and normal stress information for static and dynamic fluid systems to calculate physically meaningful results regarding Mach numbers and surface tension.
3) be able to compute friction losses for different flow regimes through application of correlations and diagrams for equivalent lengths and Fanning friction factors
4) be able to calculate work for different mechanical and flow systems for both compressible and incompressible fluids
5) be able to compute friction losses across packed beds
6) (and more to be added later)

Other metaconcepts the students should be proficient at:
1) be able to add fluid flow and heat transfer to your existing framework of chemical engineering problem solving techniques
2) be able to identify personal difficulties during problem solving and to take corrective action
3) be able to knowledgeably think of everyday examples where fluid flow and heat transfer are important 4) be able to search for and use information from published sources

Course Prerequisites:
The courses you must have taken before this course are ChEE 201 and PHYS 141.

Important Dates Related to Registration Are Found At:
http://www.registrar.arizona.edu/courses/dates-deadlines

Course Recordings, Lectures, and Attendance Policies:
This class uses a flipped classroom environment. Recorded lectures and exploratory materials are posted to d2l content and the schedule at the end of this syllabus lists which ones are required to have been accessed and examined for each lecture. These activities take 20 to 50 minutes and students will be required to submit materials to the dropbox for random spot checking for class participation. Class preparation will be evaluated through graded online d2l quizzes (10%).

The scheduled lecture times in class will build upon the learning gains made through the recorded lectures and will be used to help students in solving homework problems. Research has shown that flipped classrooms like this allow students to explore content at their own pace and then be ready for stronger understanding when in the interactive classroom. Students should be prepared to work with electronic devices to do spreadsheeting and computations in the active lectures.

Class Discussion Board: All questions about class content, policies, etc., should be posted to the Piazza discussion board. Students can join here: piazza.com/arizona/spring2018/chee203

Plagiarism: Although this course is not writing intensive, plagiarism is strongly discouraged. The plagiarism policies within the Student Code of Academic Integrity will be strictly followed: http://doc.web.arizona.edu/uapolicies.

Threatening Behavior: The general policies against threatening behavior by students will be followed: http://policy.web.arizona.edu/~policy/threaten.shtml

SALT Center and Disability Resource Center: Students who are able to use the services of the Strategic Alternatives Technology Center or may have other educational needs may see the professor at any time to discuss accommodations for their needs. However, this should be done at least 1 week prior to the first exam to allow for preparations that may be needed. Students who are registered with the Disability Resource Center must submit appropriate documentation to the instructor if they are requesting reasonable accommodations:
http://drc.arizona.edu/teach/syllabus-statement.html.

Course Grading Allocation Policies:
Attendance/online participation (10 % of total grade)

D2L preclass quizzes (10 % of the total grade – can be done collaboratively). The questions are banked and randomized and these quizzes are designed to create the opportunity for students to practice active reading and synthesis of reading content.

Individual Homework (15 % of total grade)
Homework is due at the beginning of the class on the day it is due.
Late homework will not be accepted – ever, since solutions go live as the due date arrives..
Homework solutions must be turned in by each student for these homeworks. All homework should be done independently and turned in alone. You may work with other students developing solutions but should indicate clearly that the work is your own by checking all of your own methods and numbers. One problem will be graded for partial credit and the other problems will be 10% for each problem with a serious attempt made.

Group HW (5 %) The hardest problems from each homework will be assigned to be completed in groups. One solution will be completed by the team and the full names of each person who contributed must be listed on the work submitted to d2l. Only d2l solutions will be graded.

Exams (four exams, 10 % each, 40 % of grade total).
Each exam will have an individual component that will be worth 40% of the midterm grade and will cover the 1-3 topics that are critical for students to become successful practicing engineers. The more complicated group problem will make up 60% of the midterm grade and will be one submission to the dropbox with all group member's full names included clearly in the submission. These problems will be the more comprehensive type problem students are familiar with from other classes with the instructor. DRC students should schedule their individual exam with the DRC staff before the day of the in class group exam. If a team with a DRC member in it needs additional time beyond our scheduled time in the class, accommodations will be made in real-time at that point.

Make-up exams: There will be no make-up exams. Verifiable illness with notification from the emergency dean or documentable family emergencies are valid reasons for missing an exam. In those cases, the missed midterm will be replaced by the student's average on the other three midterms.

Final Exam: (20 % of grade). The final exam time 5-8-18 at 10:30 am – noon:30. The final exam will have an individual component that is worth 40% and a group comprehensive portion that is worth 60% like the midterm exams.

Grading Criteria:
Letter grades on exams or assignments will not be determined; a final letter grade will be given at the end of the semester instead. This course will be graded on a straight scale as follows:

Total percentage of points earned	Final Grade
90-100 %	A
80 – 89.99999 %	B

70 – 79.99999 %	C
60 – 69.99999 %	D
< 60%	E

Homework Problems and Quizzes:
1. Briefly restate the problem using a sketch or diagram where appropriate. Label the sketch or diagram with all quantities involved.
2. Indicate the basis you select, and indicate any change of basis within the problem. State assumptions.
3. Include both the numerical value and units for all quantities involved, including intermediate results.
4. Answers should be circled or otherwise marked, and reported to an appropriate number of significant digits.
5. Values obtained from a handbook or other reference should be accompanied by a citation. For example:CCl4 boiling pt. 76.5 oC (CRC, pg C-373)
6. Show how you have checked your work if appropriate.
7. Be clear and concise when writing answers to questions.

Standards for Style and Presentation of Problem Sets
1. All assignments are to be submitted on 8.5 x 11 inch paper. Multiple pages must be stapled together. Unlined paper may be used if the work is done neatly. Handwriting must be legible.
2. Each page must have the student's name, the course number and the page number in the upper right hand corner. Substandard work will result in a loss of credit.

Required Extracurricular Activities: none

Special Materials Required for the Class: See online course content.

Changes to the Syllabus: The information contained in the course syllabus may be subject to change with reasonable advanced notice as deemed appropriate by the instructor

ChEE 203 Spring 2017 Class Schedule (subject to change - check D2L for updates)

Week	Date	Day	Lec #	Reading Due	Homework Due	Pre-Class D2L Quiz Due	Topic
1	1-11	R	1	Chapter 1: 1-10		Fluids Concept Inventory In D2L	Course Introduction and Energy Balance Review for Flowing Streams
2	1-16	T	2	Chapter 2: 21-25		Heat Transfer Inventory in D2L Post Lecture 1 Quiz on D2L Prelecture 2 Quiz on D2L	Newtonian Fluids Introduction
	1-18	R	3	Chapter 2: 26-44	HW 1	Prelecture 3 Quiz on D2L	Incompressible Newtonian Fluids in Pipes
3	1-23	T	4	None		Prelecture 4 Quiz on D2L	Details about Friction Losses
	1-25	R	5	Chapter 3: 66-84		Prelecture 5 Quiz on D2L	Compressible Gas Flow
4	1-30	T	6	None	HW 2	None! A break for a change…	Compressible Gas Flow
	2-1	R	7	None	Test 1 Individual Test 1 Group	None	Chapters 1-2
5	2-6	T	8	None		Prelecture 6 Quiz on D2L	Compressible Gas Flow
	2-8	R	9	None		None	Compressible Gas Flow
6	2-13	T	10	Chapter 5: 99-122	HW 3	Prelecture 10 Quiz on D2L	Non Newtonian Fluids
	2-15	R	11	Chapter 6: 133-145		Prelecture 11 Quiz on D2L	Packed Beds
7	2-20	T	12	None	HW 4		Packed Beds 2
	2-22	R	13	Chapter 7: 153-160		Prelecture 13 Quiz on D2L	Fluidized Beds
8	2-27	T	14	None	HW 5	Prelecture 14 Quiz on D2L	Fluidized Beds 2
	3-1	R	15		Test 2 Individual Test 2 Group		Up Through HW 3
9	3-6	T		Spring Break			

	3-8	R		Spring Break			
10	3-13	T	16	Chapter 8:167-173	HW 6	Prelecture 16 and 16b Quizzes on D2L	Flow Past Particles
	3-15	R	17	Chapter 9: 179-182		Prelecture 17 Quiz on D2L	Heat transfer (HT): Conduction Across a Plate
11	3-20	T	18	Chapter 9: 182-184		PL 18 Quiz	HT: Plates in series
	3-22	R	19	Chapter 9:184-188		PL 19 Quiz	HT: Conduction and convection
12	3-27	T	20	Chapter 9: 188-192	HW 7	PL 20 Quiz	HT: Convection: Flow inside pipes
	3-29	R	21	Chapter 9: 192-195			HT: Convection: Flow around pipes and shapes
13	4-3	T	22	Chapter 9: 195-209	HW 8	PL 22 Quiz	HT: Convection
	4-5	R	23		Test 3 Group Test 3 Individual		Chapters 1-7
14	4-10	T	24	Chapter 10: 211-215			HT: End of Convection
	4-12	R	25	Chapter 10: 216-220	HW 9		HT: Radiation
15	4-17	T	26	Chapter 11: 223-247		PL 26 Quiz	HT: Unsteady State
	4-19	R	27		Test 4 Individual Test 4 Group		
16	4-24	T	28	Chapter 12: 253-259; Chapter 13: 261-278		PL 28 Quiz	HT: Heat Exchangers
	4-26	R	29		HW 10	Concept Inventory Post in D2L	HT: Heat Exchangers
17	5-1	T	30	Last Day of Classes			HT: Heat Exchangers

All homework is due on the days listed above unless otherwise designated on a specific problem handout.