ChEE 203
Spring 20XX
Chemical Engineering Heat Transfer and Fluid Flow
University of Arizona

Instructors: Dr. Paul Blowers 128 Harshbarger

Preceptors:

Instructional Managers:

Instructor's Availability:
The instructor and teaching team will be available by appointment and students should post to piazza privately or publicly when they are available and the instructors will respond after communicating with each other and the teaching team.

Formal office hours will also be posted on the D2L class site.

Lecture: DD(s) Time, Location

Office Hours: See Website

Course Website: See D2L

Communicating with the Teaching Team Outside of Class:
Use the piazza discussion board to ask questions about the course or course content

The settings on Piazza allow posts to remain private to the instructor and this should be used instead of emailing the instructor directly.

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

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

Expected Learning Outcomes:
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) be able to identify different heat transfer mechanisms, select the equations to use when calculated heat losses and gains, and to calculate values for those energy shifts

7) be able to use correlations and empirical methods to estimate heat transfer coefficients for different mechanisms and then use those to compute energy changes
8) be able to use energy balances combined with heat transfer and heat transfer coefficients to estimate the size and configurations of heat exchangers needed to accomplish a given heat transfer rate between two different fluids

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

Absence and Class Participation Policies:
Class and supplemental attendance are not optional for this class. Unlike some classes where students passively copy notes, the activities done in class are critical to student success. Class attendance will be verified with a clicker question that appears at some point randomly in the day's activities and will be auto-recorded through that device. If you do not have a clicker, please get one as quickly as possible from the UA Bookstore or purchase a license for TurningPoint ResponseWare. Clickers will also be used to gauge understanding of reading material, support class discussions, facilitate understanding of new concepts and review previously taught material.

If you forget your clicker, please take a picture of your notes from that day, email the picture to chee2019attendance@gmail.com, and report the class and date in the subject so you can receive attendance points. If you miss class, you can watch the recording in Panopto in UA Tools on D2L and then email the same email address to earn 75% of the attendance points.

Absences for any sincerely held religious belief, observance or practice will be accommodated were reasonable: http://policy.arizona.edu/human-resources/religious-accommodation-policy

Absences pre-approved by the UA Dean of Students (or Dean's designee) will be honored.

Required Texts or Readings:
Engineering Flow and Heat Exchange, 3rd Edition, Levenspiel, Springer (2014). Available for free through the UA Library and linked to D2L

Required or Special Materials:
We will be using Turning Technologies Clickers and/or responseware for class extensively for both attendance and for helping the teaching team see where students need more help in mastering the content of the course. A link here helps remind students of details on how to get registered and set up: https://oia.arizona.edu/content/19

Required Examinations and Assignments:
There will be four midterm exams, approximately 11 homework assignments, and one final exam. Each midterm exam will be split into a group portion and an individual conceptual and individual calculational portion. Detailed dates are provided in a schedule later.

Required Extracurricular Activities:
None

Grading Scale and Grade Policies:
This section will highlight the breakdown of major graded elements first, then detail the grading scale, and then get into details.

The following are the major components of the total grade in this class:

Component	Percentage
Pre-class Quizzes	10 %
Attendance	10 %
Group Homework	5 %
Individual Homework	15 %
Midterm Exams	40% total (10% each)
Final Exam	20 %

Attendance/online participation (10 % of total grade)
Clickers will be used during class to assess student progress in learning concepts, and will also be used for attendance. If you forget your clicker, please take a picture of your notes from that day, email the picture to chee2019attendance@gmail.com, and report the class and date in the subject so you can receive attendance points. If you miss class, you can watch the recording in Panopto in UA Tools on D2L and then email the same email address to earn 75% of the attendance points.

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. Homework done in groups and should be submitted to the group assignment submission folder for each assignment on the day it is due, and each person must submit a full copy of the team's work with everyone's full name on it to the dropbox for credit on the group homework.

Exams (four exams, 10 % each, 40 % of grade total).
Each exam will have an individual component that will be worth 65% of the midterm grade (50% will be calculational and 15% will be conceptual) 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 35% of the midterm grade and will be one submission from the team. 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)

Final exam policies are described here:
https://registrar.arizona.edu/courses/final-examination-regulations-and-information?audience=students&cat1=10&cat2=31
and will be followed in this class.

The final exam is scheduled for May 7th, 10:30 until 12:30.
https://www.registrar.arizona.edu/students/courses/final-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

Classroom Behavior Policy

Developing your ability to effectively work in teams is an important aspect of this course, so you will regularly work in small groups in class, and you will complete weekly group homework and take group exams. You will be expected to look up information on the e-text or on websites. The teaching team will help remind you not to text or be using your devices for other reasons. You will be expected to respectfully work with all teammates and to be supportive of each other when you struggle with the content.

Threatening Behavior Policy

The general policies against threatening behavior by students will be followed:
http://policy.web.arizona.edu/education-and-student-affairs/threatening-behavior-students

Academic Integrity Policy

Plagiarism in any form, including copying the work of another student, will not be accepted. The plagiarism policies within the Student Code of Academic Integrity will be strictly followed: https://deanofstudents.arizona.edu/policies-and-codes/code-academic-integrity. Clicking in for another person is a form of academic dishonesty and will be dealt with according to the same guidelines.

Nondiscriminatory and Anti-harassment Policy

UA policies list prohibited behaviors here:
http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy

Accommodations for Students with Disabilities

Our goal in this classroom is that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, please let me know immediately so that we can discuss options. You are also welcome to contact the Disability Resource Center (520-621-3268) to

establish reasonable accommodations. For additional information on the Disability Resource Center and reasonable accommodations, please visit http://drc.arizona.edu.

If you have reasonable accommodations, please plan to meet with me by appointment or during office hours to discuss accommodations and how my course requirements and activities may impact your ability to fully participate. Please be aware that the accessible table and chairs in this room should remain available for students who find that standard classroom seating is not usable.

Schedule of Topics and Activities
The schedule appears at the end of this document in concise form.

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

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.

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	Chapter 1: 1-10		Fluids Concept Inventory In D2L	Course Introduction and Energy Balance Review for Flowing Streams
2			2	Chapter 2: 21-25		Heat Transfer Inventory in D2L Post Lecture 1 Quiz on D2L Prelecture 2 Quiz on D2L	Newtonian Fluids Introduction
			3	Chapter 2: 26-44	HW 1	Prelecture 3 Quiz on D2L	Incompressible Newtonian Fluids in Pipes
3			4	None		Prelecture 4 Quiz on D2L	Details about Friction Losses
			5	Chapter 3: 66-84		Prelecture 5 Quiz on D2L	Compressible Gas Flow
4			6	None	HW 2	None! A break for a change…	Compressible Gas Flow
			7	None	Test 1 Individual Test 1 Group	None	Chapters 1-2
5			8	None		Prelecture 6 Quiz on D2L	Compressible Gas Flow
			9	None		None	Compressible Gas Flow
6			10	Chapter 5: 99-122	HW 3	Prelecture 10 Quiz on D2L	Non Newtonian Fluids
			11	Chapter 6: 133-145		Prelecture 11 Quiz on D2L	Packed Beds
7			12	None	HW 4		Packed Beds 2
			13	Chapter 7: 153-160		Prelecture 13 Quiz on D2L	Fluidized Beds
8			14	None	HW 5	Prelecture 14 Quiz on D2L	Fluidized Beds 2
			15		Test 2 Individual Test 2 Group		Up Through HW 3
9				Spring Break			
				Spring Break			
10			16	Chapter 8:167-173	HW 6	Prelecture 16 and 16b Quizzes on D2L	Flow Past Particles

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