Transport Processes CBE 150A
R. Bruce Eldridge
University of California at Berkeley
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Instructor:

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Office Hours: M/W 1:00 – 3:00 or by appointment

Course website:

http://www.cchem.berkeley.edu/cbe150a/
Please check the website regularly for announcements, assignments, and other resources.

Teaching Assistants:

Katerina Georgiou
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Class Hours:

MWF 12:00 - 1:00 120 Latimer Hall

Recitation Hours:

Discussion 101: M 3-4p, 6 Evans
Discussion 102: M 1-2p, B51 Hildebrand
Discussion 103: Tu 2-3p, 5 Evans
Discussion 104: W 2-3p, 50 Barrows
Discussion 105: Th 9-10a, 3105 Etcheverry
Discussion 106: Th 2-3p, 136 Barrows

Prerequisites:

CBE 140 with a C- or higher

Text:

"Fundamentals of Momentum, Heat, and Mass Transfer", 5th Ed., Welty, Wicks, Wilson, and Rorrer, John Wiley and Sons, 2001.

Grading System:

Homework	10 %
Quizzes	15 %
Exams (3)	45 %
Final Exam	30 %

Final course grades will be assigned according to the "gap system". In other words, the final grade distribution for all students will be plotted and cut-offs for grades will be determined based on breaks in the distribution. Thus, a student's performance in the class is measured relative to the performance of the remainder of the class.

Course Overview:

1. Static fluid phenomena
2. Flow of incompressible fluids
3. Flow of compressible fluids
4. Flow past objects
5. Conductive heat transfer
6. Convective heat transfer
7. Heat transfer equipment design
8. Radiation

Goals: The course covers analysis and design of heat exchangers, fluid flow equipment and some interphase contacting devices. This course serves to integrate the fundamental concepts learned in CBE 140 with practical chemical engineering problems and industrial applications. Key objectives of this course are to enhance problem definition and problem solving skills of the student, and to improve the student's ability to make calculations and obtain correct final answers.

Knowledge, Abilities, and Skills Students Should Have Entering This Course:

1. The catalog lists CBE 140 as a prerequisite. The course relies heavily on the mass, momentum, heat and energy balance equations developed in CBE 140.
2. Basic mathematical and computer programming skills.
3. Ability to perform macroscopic mass and energy balances under steady state and dynamic conditions (from CBE 140)
4. Familiarity with equations of state, particularly the ideal gas law (from CBE 140).
5. Familiarity with concepts of enthalpy, work, heat and other thermodynamic quantities (from CBE 140)

Knowledge, Abilities, and Skills Students Should Gain From This Course:

1. Familiarity with the methods used to analyze and design fluid processing equipment, heat exchangers and interphase contacting devices for incompressible fluids.
2. Recognition of the challenges of designing processing equipment for compressible fluids.
3. The ability to analyze and size piping networks, valves, pumps, compressors and flow meters.
4. The ability to determine heat transfer coefficients and the ability to size heat exchangers.
5. The ability to apply the principles of transport phenomena to the analysis of a wide range of processing equipment including evaporators, fluidized beds, and chemical reactors.

Impact on Subsequent Courses in Curriculum:

The material taught in CBE 150A will be used extensively in the plant design course and in the unit operations lab. (CBE 154) The material will also be of use in the reactor design course (CBE 142) when topics such as packed and fluidized bed reactors are discussed and in the design course (CBE 160).

Course Format & Learning Activities:

- The textbook and supplemental notes provide overall excellent coverage of the application of momentum, heat and mass transfer. These readings are intended to provide you with some theoretical coverage of the field, but will typically emphasize the practical application of unit operation principles.
- Lectures will complement readings from your textbook and class handouts. In general, lectures will be interactive, combining in-class discussions with small group problem solving exercises, chalk board problem analyses, etc. Open-ended questions, similar to problems you may encounter in your later engineering practice, will provide you with opportunities to enhance your problem formulation and problem solving skills. Videos on how certain pieces of equipment function will provide you with the ability to identify pieces of equipment and will also help you to link the theory with the physical.
- Discussion sections will be overseen by the TA's and/or the Professor and will focus on the solution of additional relevant problems. In some cases, we will cover difficult homework problems and go through exam solutions during recitation. In all cases, an emphasis will be placed on how a problem is approached and why a particular approach is selected.
- Regular homework assignments on the technical material will be given to provide practice at applying the concepts covered in lecture. Group discussion of the homework (but not copying) is encouraged. However, it is important for exams that each student know how to independently work the assigned problems on his/her own.
- Quizzes will be given in-class at random times throughout the semester and are designed to emphasize lecture and homework concepts.
- Three exams and a final will test both retention of concepts and facts, and the ability to apply problem-solving skills. Material tested will be extracted from the readings, homework, lectures, projects, and recitations.

Performance Feedback:

Feedback on your performance throughout the semester is a key component to the learning process. In addition to feedback on homework, quizzes, and exams through solution sets, comments and grades, you will receive immediate input through in-class problem-solving and group activities. Feedback will also be actively encouraged through visits during hours or by appointment. However, I encourage you to attempt all problems on your own prior to seeking additional help.

Course Policies:

Attendance -- Attendance at lectures and recitation sessions, although not mandatory, is important for your mastery of the subject matter.

Homework & Projects --

Homework and projects must be received at the beginning of the class period in which they are due.

Homework must follow the guidelines from CBE 140: engineering paper must be used, problem statement must be defined, sources of information (Appendices, etc.) must be identified, and an arrow must point to a single boxed solution. Illegible papers or those not adhering to the criteria established in CBE 140 will not be graded. Solutions to all problems must include adequate steps, and explanations where necessary, for us to understand how you arrived at an answer. Just an equation and a final answer will not be acceptable. The total homework score is worth 10 % of your overall course grade.

Grading Policies -- Homework, quizzes, and exams will be **approximately** graded according to the following:

5%	Participation (making any honest attempt)
15%	Accurately defining the problem (drawing a correct schematic/interpretation of the system)
40%	Setting up the problem (making accurate assumptions, defining the correct equations, adequately explaining all steps required to reach a solution, justifying your approach)
30%	Correctness and completeness (making accurate calculations, using correct conversions, using appropriate physical properties, identifying sources of information, accurately interpreting data from tables, carrying solution to completion, using correct significant figures)
10%	Neatness, organization (logical flow), and boxing final solutions

Problems should be worked in units that are consistent with the units given in the problem statement. The final solution must be reported in units consistent with those given in the problem statement. For example, if the problem statement gives metric units, do not report your solution in English units.

Note: Conceptual errors are weighted more heavily than simple mathematical (calculation) errors.

Late Assignments – No late assignments will be accepted without permission from Dr. Eldridge.

Grading Disputes -- Discussion on assignments should be initiated with the TA or grader, and only math errors and oversights will be considered valid reasons for dispute. If your work is not clear or the specific question involves subjectivity, then there is no justification for re-grading. Grades will not be discussed after one week from the date the assignment is returned.

Quizzes -- Quizzes will be **closed book** with required tables and figures supplied. No make-up quizzes will be given. Students missing a quiz with an approved excuse will have the missed quiz dropped from the final grade tabulation.

Exams --

Exams will be **closed book and open notes**. A review session will be held prior to each exam.

Requests for re-grading must be submitted to the professor **within 1 week** after the graded exam has been returned. If re-grading is desired, then the entire exam is subject to re-grading. As with assignments, if your work is not clear or the specific question involves subjectivity, then there is no justification for re-grading.

Missed Exam -- No make-up exams will be given without a written excuse for the absence.

Final Exam -- The location will be announced later in the semester. The date and time of the exam cannot be changed, and there will be no make-up final. Registration for this course includes the university-scheduled final exam date.

Cheating -- Cheating is strictly forbidden and anyone found doing so will be turned over to the University and will be dealt with according to University policy. Working together on homework is encouraged, but each person must independently write-up his or her own work. Copying homework and photocopying graphs and figures between individuals is considered cheating.

Drop Policy– Registration changes after the official drop date require approval by the Department Chair and/or the Dean of Engineering.

Disabilities – Students who need academic accommodations (for example, a notetaker), should request them from the Disabled Students' Program, 260 César Chávez Center, 642-0518 (voice or TTY). DSP is the campus office responsible for verifying disability-related need for academic accommodations, assessing that need, and for planning accommodations in cooperation with students and instructors as needed and consistent with course requirements.