Chemical Engineering 150B
Transport and Separation Processes - Fall 2024

Welcome to CBE 150B! In this course, we will learn about mass transfer as well as different methods for chemical separation. bCourses has more course information for the class.

Go here for typos in the notes

Overview of Weekly schedule

	Monday	Tuesday	Wednesday	Thursday	Friday
9 am					
10 am					
11 am	**OH (LK)** Hildebrand 100D	**Discussion (DS)** 3109 Etchevery	**OH (DS)** Hildebrand 100D		**OH (Frechette)** Gilman 101-C
12 pm		**OH (DS)** Hildebrand 100F			
1 pm					
2 pm	Class 390 Hearst Mining	**OH (Frechette)** Gilman 101-C	**Class** 390 Hearst Mining		**Class** 390 Hearst Mining
3 pm	**Discussion (DS)** 107 GenPlant Bio				**Discussion (ZH)** 109 Dwinelle
4 pm	**OH (ZH)** Zoom			**OH (JR)** Latimer 425	**OH (ZH)** Latimer 425

Contact information:

Instructor: **Joelle Frechette** (jfrechette@berkeley.edu), Gilman 101-C

Teaching assistants: Zirong He (zironghe@berkeley.edu)
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Lecture Hours: MWF, 2:00 pm – 3:00 pm; Hearst Mining 390.

Course Grade: The course grade will be determined by the following:

Homework: 15%
Quizzes and polls 5%
Midterms 50 %*
Midterm Exam 1 (October 7)
Midterm Exam 2 (November 18)
Final Examination: 30%**

* Your Highest MT score 30% and lowest 20%

** If it helps your overall grade, we will replace your lowest midterm score with your final exam grade by giving you the same percentage of the points (rounded up to a whole number of points) on that midterm as the percentage you achieve on the final exam.

Final letter grade policy: Grades will be determined on an absolute scale. We reserve the right to shift these percentages down (but not up). For example, if a particular exam is more difficult than we originally planned.

Letter grade	Class score
A	85-100 %
A-	80-84.9 %
B+	75-79.9 %
B	70-74.9%
B-	65-69.9 %
C+	60-64.9 %
C	55-59.9%
C-	50-54.9 %
D	40-49.9 %
F	< 39.9 %

Texts:

1. Welty, Fundamentals of Momentum, Heat, and Mass Transfer, Seventh Edition, John Wiley & Sons, Hoboken, NJ, 2019.
2. Seader, Henley, and Roper, Separation Process Principles, Fourth Edition, John Wiley & Sons, Hoboken, NJ, 2016.

Class Climate:

We are committed to creating a classroom environment that values the diversity of experiences and perspectives that all students bring. Everyone here has the right to be treated with dignity and respect. We believe fostering an inclusive climate is important because research and our experience show that students who interact with peers who are different from themselves learn new things and experience tangible educational outcomes. Please join us in creating a welcoming and vibrant classroom climate. Note that you should expect to be challenged intellectually by us, the GSIs, and your peers, and at times this may feel uncomfortable. Indeed, it can be helpful to be pushed sometimes in order to learn and grow. But at no time in this learning process should someone be singled out or treated unequally on the basis of any seen or unseen part of their identity.

Online platforms:

We use many online platforms for the course:

- **bCourses** is the main online source for the course. We will communicate all course related information as well as materials (notes, HW, solutions) via bCourses. Please set your bCourses notifications so that you do not miss announcements or assignments, and check the site regularly.
- **Iclicker** we use iclicker for polls during class. Polls are graded on participation. Full credit for attendance will be given for attending 75% of the lectures. https://www.iclicker.com/instructors/software/iclicker-cloud/
- **Gradescope.** Homework should be scanned and submitted through gradescope. Please contact the TAs if you have any trouble with uploading on gradescope. We will also use gradescope to grade exams and for quizzes. Grades will also be returned via Gradescope. If you have not been added to gradescope, please contact the TAs immediately.
- **Piazza.** Piazza will be used as the online Q&A platform. Enrollment in Piazza is mandatory, and as a general rule all questions related to clarifications on the lectures, discussion sections and homeworks must be posted on Piazza rather than mailing the instructors or TAs. Please do not post anything resembling solutions to a homework

problem before it is due. To join the class on Piazza, please either follow this link: https://piazza.com/berkeley/fall2024/cbe150b.

Computer Use:
Students will be expected to use computers to solve some of the homework assignments. You can use the tools and methods learned in CBE 130 (Python), Matlab, or Excel.

Class Participation: Attendance of all lectures is expected. Throughout the semester we will administer polls using iclicker that will be graded on participation.

Homework policy:
- Homework will be assigned on Friday, posted on bCourses that day.
- There will be ~12 homeworks due by 11:59 pm every Monday except on week with a midterm.
- ***We will drop the lowest three HW scores.***
- Homework should be scanned and submitted through gradescope.
- Only under ***exceptional*** circumstances will late work be accepted. Written documentation may be required to receive credit for late work. Late submissions without prior approval will not be considered and will receive a zero grade.
- Problem sets will typically entail 3-4 problems that account for the grade. Some problem sets may involve a "bonus question" that will most likely be a problem of higher difficulty level than average. Solving the bonus question is not necessary for achieving the full homework grade, but a solution or a substantial attempt will earn a bonus grade that may help students compensate for missed homework or homework will lower grades. Note: As a flipside, you may not receive much formal help on a bonus question.
- Students should feel free to discuss the homework assignment with others; **however, the final product must be entirely your own work**.

Exam policy:
- In case of a genuine medical reason that will cause you to miss an exam, please email the whole 150B team notifying us of your condition with a doctor's note so we can explore options for you.
- In general, exams will not be given early or late. Our general policy is that if you miss an exam for a valid reason such as a medical emergency, we will use the final exam to replace a midterm score. Missing more than one exam will result in either an I or an F grade for the course. Missing an exam without a valid reason will result in a zero grade for that exam.
- You will be allowed to bring a single 8 ½ x11 cheat-sheet (double-sided) to a midterm (letter-size paper, ***handwritten*** notes on both sides). You will be expected to turn the cheat-sheet with your exam. You will be able to re-use your midterm cheat sheets for the final. You can have three cheat sheets for the final exam.
- The only materials allowed at the exam are pen, paper, ruler, calculator, and cheat sheet. No headphone, phone, computer, notes, or any other material is allowed. Using other material will be considered as plagiarism and will be reported.

Communications with the Instructors:

- All questions about course content (e.g., homework problems, lecture concepts, due dates, exam format) must be asked during lecture, discussion section, office hours, or over Piazza so that all may benefit from the answer. While the instructors will monitor Piazza daily, please note that we cannot respond to your questions instantaneously. We

highly encourage you to answer each others' questions (and it will help with your participation score).
- The only questions that may be asked by email are those related to your personal situation, such as technical difficulties you are experiencing or if you need an extension/ accommodation due to a health issue. In this case, please remember to include the whole 150B Team (instructor + Tas) in your communication. This ensures that everyone is on the same page.
- We will do our best to respond to your email within 24 hours on weekdays. Please note that we cannot guarantee responses to Piazza questions asked within a 12 hour period preceding exams and homeworks.

Expectations of Academic Integrity and Ethics:

We follow the Chemical and Biomolecular Engineering Department policy on academic misconduct. You can find information about the policies here.

We are privileged to participate in the pursuit of knowledge and truth in higher education at UC Berkeley, where students and instructors are expected to maintain academic integrity and an environment of respect for the course of study and one another at all times. Our class is a safe space for people diverse in traits and ideology to exchange ideas and grow in experience and knowledge. Direct any concerns about classroom environment immediately to the instructor.

The student community at UC Berkeley has adopted the following **Honor Code:** ***"As a member of the UC Berkeley community, I act with honesty, integrity, and respect for others."*** The transition to remote instruction means that exams will not be proctored in person and obviates the need for each member of our learning community to commit fully to the Honor Code. The instructors expect that you will adhere to this code without fail. *Anyone caught cheating on a quiz or exam, including working with a peer where individual work was specifically required, will receive a failing grade in the course and will be reported.*

Plagiarism: Any item submitted by you and that bears your name is presumed to be your own original work. You may use words or ideas of other individuals from publications, web sites, or other sources, but only with **proper attribution**. "Proper attribution" means that you have fully identified the original source and the extent of your use of the words or ideas of others that you reproduce. To copy text or ideas without proper attribution is plagiarism and will result in a failing grade for your assignment. See the library webpage for additional information on plagiarism and how to avoid it.

Accommodation of Special Situations and Needs:
If you need accommodations related to physical, psychological, or learning abilities, please make an appointment to speak to the instructor so we can determine how to best support your needs.

If you normally attend class but must miss a lecture or discussion section because of religious observation, holy day, or other obligation, please inform the instructor by the end of the second week of the term to arrange to submit work early or reschedule an exam. It is your responsibility to review materials outside of class on your own to make up for class time missed.

Below are links to important University policies and resources.

1. UC Berkeley Academic Honor Code

2. Accommodation of Religious Creed
3. Conflicts Between Extracurricular Activities and Academic Requirements
4. Absences Due to Illness
5. Accommodation for Disability
6. Accommodation for Pregnancy and Parenting
7. Reading, Review, Recitation (RRR) Week
8. Commencement Ceremonies and Final Exams
9. Hardship Accommodations
10. Accommodation and Support Measures for Sexual Harassment and Sexual Violence

Help is available for students:
College can be a simultaneously rewarding and challenging experience. To support students at UC Berkeley counseling services are available to you through the Tang Center:

https://uhs.berkeley.edu/counseling.
https://uhs.berkeley.edu/coronavirus/student-mental-health

Fall Semester 2024 Tentative Class Schedule

Week	Date	#	Topic	Book	HW
1	8/28	1	Introduction to mass transfer	24 in W3R	
	8/30	2	Flux and diffusion coefficient	24 in W3R	
2	9/02	-	No class labor day		HW1 due
	9/04	3	Differential equation for mass transfer	25 in W3R	
	9/06	4	Examples steady-state diffusion	26 in W3R	GSQ1
3	9/09	5	Examples steady-state diffusion	26 in W3R	HW2 due
	9/11	6	Homogeneous reaction and falling film	26 in W3R	
	9/13	7	Unsteady mass diffusion	27 in W3R	GSQ2
4	9/16	8	Convective mass transfer - Laminar boundary layer	28 in W3R	HW3 due
	9/18	9	Convective mass transfer - Turbulent and analogies	28 in W3R	
	9/20	10	Convective mass transfer - I	30 in W3R	GSQ3
5	9/23	11	Convective mass transfer-II	30 in W3R	HW4 Due
	9/25	12	Mass transfer across phases - I	29 in W3R	
	9/27	13	Mass transfer across phases- II	Notes	GSQ4
6	9/30	14	Midterm review		HW5 due
	10/02	15	Introduction to separations and energetics	Notes	
	10/04	16	Review of VLE equilibria -1	Notes	GSQ5
7	10/07	17	Midterm 1 (HW1-5)		no HW
	10/09	18	VLE equilibria - II	1-2 in SH	
	10/11	19	Flash separations - I	2,4 in SH	GSQ6
8	10/14	20	Flash calculations - II	4 in SH	HW6 due
	10/16	21	Adsorption and stripping (1)	6 in SH	
	10/18	22	Adsorption and stripping (2)	6 in SH	GSQ7

9	10/21	23	Adsorption and stripping (3)	6 in SH	HW7 due
	10/23	24	Distillation (1)	7 in SH	
	10/25	25	Distillation (2)	7 in SH	GSQ8
10	10/28	26	Distillation (3)	7 in SH	HW8 due
	10/30	27	Liquid-Liquid extraction (1)	8 in SH	
	11/01	28	Liquid-Liquid extraction (2)	8 in SH	GSQ9
11	11/04	29	Membrane separations (1)	14 in SH	HW9 due
	11/06	30	Membrane separations (2)	14 in SH	
	11/08	31	Membrane separation (3)	14 in SH	GSQ10
12	11/11	32	Academic & Administrative Holiday		HW10 due
	11/13	33	Midterm review		
	11/15	–	Reverse osmosis (1)	14 in SH	GSQ11
13	11/18	34	Midterm 2 (HW 6-10)		no HW
	11/20	35	Adsorption (1)	15 in SH	
	11/22	36	Adsorption (2)	15 in SH	
14	11/25	37	Adsorption (3)	15 in SH	HW11 due
	11/27	–	Non-instructional day		
	11/29	–	Academic & Administrative Holiday		
15	12/02	38	Adsorption (4)	15 in SH	HW 12 due
	12/04	39	Final review (1)		
	12/06	40	Final review -GSIs		GSQ12