ChE-310: Fundamentals of Separation Processes

Instructor
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Teaching Instructors
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Classroom
Online via zoom (https://epfl.zoom.us/j/82654494502)

Meeting time
Friday, 1:15 – 4:00 PM
13 sessions

Moodle Site
Course information including the syllabus, pre-lecture readings, lecture notes and announcements can be found at the Moodle site.
https://moodle.epfl.ch/course/view.php?id=15847

Summary
Students will learn the fundamentals concepts related to molecular separations in industrial processes. Students will employ these concepts to design equilibrium-stage and rate-limited processes for the separation of homogeneous mixture.

Intended Learning Outcome
By the end of the course, students should be able to

- Use of energy separating agent (ESA) and mass separating agent (MSA) for separating chemical mixtures.
- Calculate composition of streams leaving a separation process using the concepts of mass and energy balances, phase equilibria, mass transfer and diffusion.
- Design equilibrium-stage separation process (number of stages, concentration of streams entering or leaving the processes) for the desired outlet concentration from a given feed.

Course Content
Mass and Energy Balances
Thermodynamics of Separations/Phase Equilibria/Degree of Freedom
Flash Distillation
Column Distillation
Multicomponent Distillation
Absorption and Stripping
Liquid-Liquid Extraction
Diffusion and Mass Transfer
Adsorption Processes
Membrane Processes

Textbooks
Separation Process Engineering by P. C. Wankat (available online in the library)
Separation Process Principles by J. D. Seader, E. J. Henley, D. K. Roper

Teaching Method

1. Because of the current COVID situation, classes will be over zoom. The zoom link is provided above.

2. Examples and exercise will be conducted in between the lecture. For problems using graphical approach, students are encouraged to use graph papers or excel sheets.

3. Lecture notes and lecture recordings will be available on the moodle page. These will be posted after the class to help students if they encounter a bad network connection.

4. I will also provide lecture notes before the class. These notes will have occasionally empty spaces (gaps) that students can fill by taking notes during the class. In my opinion and based on previous years' feedback, this helps in the learning process of important concepts especially the derivations.

5. Your smartphone (device that allows you to answer interactive questions in class) would be used to conduct quizzes (usually multiple-choice questions). These quizzes are meant to support the learning process. For example, questions would be asked at the start of every class to gauge understanding of the subject and review concepts. Your responses would be anonymous. Answers will not be used for formal assessment.

6. To participate in quizzes using smartphone, you will have to install the 'TurningPoint' app on your smartphone (Android or iOS). You can find the details here:

   https://play.google.com/store/apps/details?id=com.turningTech.Responseware&hl=en-ca
   https://apps.apple.com/us/app/turningpoint/id300028504

Piazza
Sign-up link: piazza.com/epfl.ch/spring2021/che310

Questions/discussions on the concepts, in-class exercises and homework problems can be discussed on Piazza. I encourage you to ask questions when you're struggling to understand a concept—you can even do so anonymously.

Post your questions to Piazza instead of emailing me or TA's directly. Think of Piazza as a Q&A wiki for the class. Every question has just a single students' answer that students can edit collectively (and a single instructors' answer for instructors).

Post your questions in relevant folder inside the Q&A so that the questions can be searched easily, and answered timely. For example, question related to homework1 should be posted in the folder 'hw1'. Similarly, questions related to lecture 1 including in-class exercises in lecture 1 should be posted in folder 'lecture1'.

Logistics issues: Students are encouraged post in Piazza under the folder ‘logistics’, if they are facing difficulty in following the course. This is especially important for the online students as they can have network connectivity issues, issues in seeing slides, and in general, issues in following the lectures.

Grades

1. Homework (total 13, 50% of the total grade)
2. Final written exam (50% of the total grade)

About homework: After every class on Friday, a homework will be posted on moodle. Typically, homeworks will comprise of 1-3 questions focused on the key concepts. Students are expected to submit the homework on moodle before the start of the next class. Since scanning the homework may not be feasible, students can take picture of their homework. However, they should make sure the picture is clear and legible. Homework comprises of a significant portion of the overall grade, and therefore, are extremely important.

Students are expected to consult each other on the approach to solve the homework. However, students must arrive at the solution independently and write their homework independently. Homework should be done on A4 sheet, and should be written clearly. Solution to the homework will be posted at the end of the subsequent class.

Clarifications related to homework problem can be posted on Piazza under the relevant homework folder.