ChE-310: Fundamentals of Separation Processes

Instructor
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Teaching Instructors
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Classroom
CH B3 30

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. Projector slides would be used to deliver the course content. Examples and exercise will be conducted in between the lecture. For problems using graphical approach, graph papers would be provided but students are expected to bring their own pencil, rulers, etc.

2. Your smartphone or clickers (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.

3. 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

4. Clickers will be distributed in the class, and students are responsible to bring them to every lecture. Student borrowing the clickers must return them in the last class of the semester. Students are responsible for getting assistance in case of technical issues (for example, low battery). Clickers can also be borrowed from the library. To borrow a clicker, visit the library main counter at the Rolex Learning center (Mon-Fri, 8 AM to 8 PM). The loan is free of charge and the only thing you need is your CAMIPRO.

Grade

1. Mid-semester exam (24%) - April 3 (2:15 – 3:45 PM)
2. Final written exam (50%)
3. Homework (total 13, 26%)

About mid-semester exam: this exam will be held during the semester during the scheduled lecture hours in the classroom. It will be 90 minutes long. A tentative schedule is mentioned above. The exact schedule will be announced in class.

About homework: At the end of every class (Friday), a homework will be posted on moodle comprising of one or two questions focused on the key concepts. Students are expected to turn the homework in by the next class. For the last class of the course (May 29), student should scan their homework and submit it by email, latest by end of the day of June 5.

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.