

ChE-401: Fundamentals of Separation Processes (Equilibrium-stage Separation Processes)

Instructor

Prof. Kumar Varoon Agrawal

kumar.agrawal@epfl.ch

Teaching Instructors

Mojtaba Rezaei

Mohammad Tohidivahdat

mojtaba.rezaei@epfl.ch

mohammad.vahdat@epfl.ch

Classroom

CHB 331

Meeting time

Monday, 3 – 6 PM

13 lectures between Feb 19 – May 28.

No classes on April 2 (Easter holiday) and May 21 (White Monday)

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=15573>

Summary

Students will learn the fundamentals concepts of the separation processes. Students will employ these concepts to design equilibrium-stage and diffusional processes for the separation of homogeneous chemical mixture.

Intended Learning Outcome

By the end of the course, students should be able to

- Calculate composition of streams leaving a separation process using the concepts of mass and energy balances, phase equilibria, mass transfer and diffusion.
- Design the separation process (number of equilibrium-stages, height, diameter, etc.) for the desired outlet concentration from a given feed.
- Identify the optimal separation process for a given chemical stream by comparing the energy footprint of several processes for the needed separation.

Course Content

Mass and Energy Balances

Thermodynamics of Separations

Diffusion, Convection and Mass Transfer

Flash Distillation

Column Distillation

Multicomponent Distillation

Absorption and Stripping

Liquid-Liquid Extraction

Adsorption Processes

Membrane Processes

Textbooks

Separation Process Principles by J. D. Seader, E. J. Henley, D. K. Roper

Separation Process Engineering by P. C. Wankat (available online in the library)

Teaching Method

1. Blackboard and 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. In addition, a process simulator, Aspen Plus, will be used to illustrate the concepts, inferring the governing principles. Students are NOT expected to know Aspen Plus a priori. The use of Aspen plus will be restricted to illustrate the concepts by the instructor.
3. 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, clicker based question would be asked at the start of every class to gauge understanding of the subject and review concepts. Clicker responses would be anonymous. Answers will not be used for formal assessment. Clickers can be borrowed from the library, and should be brought to every lecture. Students are responsible for registering for the clickers, getting assistance in case of technical issues (for example, low battery). 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.
4. Alternative to clickers, you can use your own smartphone/tablet to answer questions. Check if your device is compatible using the instructions on the webpage <http://clickers.epfl.ch/students>. You will have to install the 'ResponseWare' app. Don't forget to bring your device to class.

Grade

Final exam would contribute 100% to the grades.