ChE-402: Diffusion and Mass Transfer

Instructor
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Teaching Instructors
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Classroom
GR B3 30

Meeting time
Tuesday, 15:15 – 18:00 (three 45-minute sessions)
13 sessions (Sep 20 onwards)

Moodle Site
Course information including the syllabus, lecture notes and announcements can be found at the Moodle site.
https://moodle.epfl.ch/course/view.php?id=9401

Course Summary
This course aims to provide an in-depth understanding of diffusion and mass transfer and their role in several chemical processes.

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

- Understand the origin of diffusion, and roles of diffusion and convection in overall mass transport in a number of scenarios.
- Setup mathematical models that describe complex mass transport cases.
- Apply various diffusion and mass transfer models to analyze and solve a wide-range of problems dealing with mass transport.

Course Content

1. Fundamentals of diffusion
2. Diffusion in dilute solutions
3. Diffusion in concentrated solutions
4. Diffusion coefficients in gases, liquids and solids
5. Diffusion in nanoporous materials
6. Multicomponent diffusion
7. Dispersion
8. Theories in mass transfer
9. Diffusion in chemical reactions
10. Modeling diffusion in membranes

Textbooks
Diffusion: Mass Transfer in Fluid Systems by E. L. Cussler (available in the library).

Teaching Method

1. Projector slides would be used to deliver the course content to the students in class.

2. A few exercise problems will be conducted during the lecture by Prof. Agrawal and in the last session by the teaching assistant. Students are encouraged to attend the entire session.
3. Lecture notes of a specific class will be available on the moodle page (https://moodle.epfl.ch/course/view.php?id=9401). To encourage students' participation especially on the mathematical derivation of important concepts, some notes will be excluded. A complete set of notes will be provided at the end of the class. Lectures will be recorded to assist online students especially if they encounter a bad network connection. The link to the recorded lectures will be posted after the class.
4. We will use polling to conduct short quizzes (usually multiple-choice questions). These quizzes are meant to support the learning process. For example, questions could 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. To participate in the polling, 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://itunes.apple.com/us/app/turningpoint/id300028504?mt=8

Piazza
Sign-up link: piazza.com/epfl.ch/fall2022/che402

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 Tuesday, a homework will be posted on moodle. Typically, homework will comprise of one or more questions focused on a key concept. Students are expected to submit the homework in classroom at the start of the next class.

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.