

ChE-402

Diffusion and mass transfer

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Cursus	Sem.	Type
Ing.-chim.	MA1, MA3	Obl.

Language of teaching	English
Credits	4
Session	Winter
Semester	Fall
Exam	Written
Workload	120h
Weeks	14
Hours	3 weekly
Courses	2 weekly
Exercises	1 weekly
Number of positions	

Summary

This course aims to provide an in-depth understanding of diffusion and mass transfer, an essential tool for the chemical engineers.

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

Keywords

Diffusion, mass transfer coefficient, convection, dispersion, multicomponent diffusion, mass transfer with reaction

Learning Prerequisites**Important concepts to start the course**

Mass, and energy balance
Basics of diffusion and mass transfer

Learning Outcomes

By the end of the course, the student must be able to:

- Carry out calculations to extract concentration profile for a given system
- Carry out calculations to extract mass transfer rate for a given system
- Formalize 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.

Teaching methods

1. Projector slides would be used to deliver the course content to the students in class.
2. Exercise will be conducted during the lecture.
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.
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

Questions/discussions on the concepts, in-class exercises and homework problems can be optionally discussed on Piazza.

Expected student activities

Active participation in every class (taking down lecture notes, solving exercise, in-class discussion, quizzes)

Assessment methods

Weekly homework (50%)

Final exam (50%)

Supervision

Office hours	Yes
Assistants	Yes
Forum	Yes

Resources

Virtual desktop infrastructure (VDI)

No

Bibliography

Diffusion: mass transfer in fluid systems by Cussler

Ressources en bibliothèque

- [Diffusion: mass transfer in fluid systems / Cussler](#)

Moodle Link

- <https://go.epfl.ch/ChE-402>