

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. Theories in mass transfer
8. Diffusion in chemical reactions
9. Modeling diffusion in membranes

Keywords

Diffusion, mass transfer coefficient, convection, 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. Lecture videos will be posted on Moodle. Students are expected to review the recording before attending the lecture.
2. Links to recorded lecture videos, as well as complete lecture notes will be posted on Moodle. Students are expected to review these videos before the class. The class will then mainly discuss questions/clarifications with these videos, with the possibility of additional in-class exercise problems.
3. All videos are available at <https://mediaspace.epfl.ch>. Go to EPFL Courses, then Chemical Engineering - ChE. Here you can find the folder for the course.
4. An exercise session led by the TAs will be held during the last hour of the lecture.
5. Your smartphone 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.

Ed Discussion Forum

Questions/discussions on the concepts, in-class exercises and homework problems can be discussed on this forum. It can be accessed via Moodle.

Expected student activities

Active participation in every class (solving exercise, in-class discussion, quizzes)

Assessment methods

Mid-term Exam (30%)

Final exam (70%)

Supervision

Office hours	Yes
Assistant.e.s	Yes
Forum	Yes

Resources

Virtual desktop infrastructure (VDI)

No

Bibliography

Diffusion: mass transfer in fluid systems by Cussler

Ressources en bibliothèque

- [Find the reference at the Library](#)

Moodle Link

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