

ChE-204

Introduction to transport phenomena

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Cursus	Sem.	Type
Biotechnology minor	E	Opt.
Chemistry and chemical engineering	BA4	Obl.
HES - CGC	E	Opt.

Language of teaching	English
Credits	3
Session	Summer
Semester	Spring
Exam	During the semester
Workload	90h
Weeks	14
Hours	3 weekly
Courses	2 weekly
Exercises	1 weekly
Number of positions	

Summary

This course aims at understanding the basic equations behind macroscopic and microscopic transport phenomena (mass, heat and momentum).

Content

- Conservation of energy, heat and momentum
- Macroscopic balances and advective transport
- Bernoulli equation
- Equations and parameters for microscopic transport: mass transport (Fick's law), heat transport (Fourier's law) and momentum transport (Newton's law)
- Analogy between the three types of transfer
- Introduction to non-dimensional quantities
- Combined macroscopic and microscopic transfer applications (e.g. pipe flow with friction loss), heat exchangers.

Keywords

macroscopic balances, transport phenomena, flux equation

Learning Prerequisites**Required courses**

Introduction to chemical engineering

Learning Outcomes

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

- Identify heat transfer, mass transfer and momentum phenomena in lab, industrial and daily environment which are relevant both for chemists and chemical engineers
- Identify quantities and subjects used in transport phenomena
- Describe transport phenomena at the macroscopic and at the molecular level
- Recognize the similarities between the three transport phenomena
- Analyze problems involving transfer phenomena

- Use balance to solve problems
- Justify your approach to problem solving

Teaching methods

Lectures with exercises

Expected student activities

solution of exercises

Assessment methods

Two written tests during the semester

Resources

Bibliography

Introductory Transport Phenomena: R. B. Bird, W.E. Stewart, E.N. Lightfoot, D.J. Klingenberg. John Wiley and Sons, Inc. (2014)

Ressources en bibliothèque

- [Introductory transport phenomena / Bird](#)

Moodle Link

- <https://go.epfl.ch/ChE-204>