ChE-204

Introduction to transport phenomena

Buonsanti Raffaella

Cursus	Sem.	Type
Chimie et génie chimique	BA4	Obl.
Mineur en Biotechnologie	E	Obl.

Language	English
Credits	2
Session	Summer
Semester	Spring
Exam	During the semester
Workload	60h
Weeks	14
Hours	**3 weekly**
Lecture	2 weekly
Exercises	1 weekly

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’s 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)