

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
<b>Hours</b>	<b>3 weekly</b>
Courses	2 weekly
Exercises	1 weekly
<b>Number of positions</b>	

**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)

#### **Ressources en bibliothèque**

- [Introductory transport phenomena / Bird](#)

#### **Moodle Link**

- <https://moodle.epfl.ch/course/view.php?id=15322>