

ENG-420

**Environmental transport phenomena**

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Cursus	Sem.	Type
Computational science and Engineering	MA1, MA3	Opt.
Computational science and engineering minor	H	Opt.
Energy Science and Technology	MA1, MA3	Opt.
Environmental Sciences and Engineering	MA1, MA3	Opt.
Mechanical engineering	MA1, MA3	Opt.

Language of teaching	English
Credits	5
Session	Winter
Semester	Fall
Exam	Written
Workload	150h
Weeks	14
<b>Hours</b>	<b>5 weekly</b>
Lecture	2 weekly
Exercises	1 weekly
Project	2 weekly
<b>Number of positions</b>	

**Summary**

The course aims at introducing basic physical aspects of molecular and turbulent diffusion, as well as of dispersion processes, their mathematical modeling, solutions and related environmental applications

**Content**

- Advection and diffusion
- Point source pollution
- Introduction to turbulence
- Turbulent dispersion
- Mixing in rivers, lakes and in reservoirs
- Atmospheric boundary layer
- Computational fluid dynamics

**Keywords**

Environmental diffusion, advection, dispersion, mixing, pollution, rivers, atmospheric boundary layer

**Learning Prerequisites****Recommended courses**

Basic knowledge of fluid mechanics

**Learning Outcomes**

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

- Interpret the physics of transport processes
- Elaborate linear models
- Solve linear models
- Develop numerical transport models with FLUENT
- Interpret and describe the physical processes relevant for environmental transport
- Elaborate and solve simple physical models for environmental transport
- Choose and apply appropriate computational fluid dynamics (CFD) approaches and models
- Develop numerical transport models with FLUENT: problem formulation, modeling, and interpretation of the results
- Describe and interpret the physical processes relevant for environmental transport
- Apply and choose appropriate computational fluid dynamics (CFD) approaches and models

- Solve and elaborate simple physical models for environmental transport

### **Transversal skills**

- Use a work methodology appropriate to the task.
- Take feedback (critique) and respond in an appropriate manner.
- Write a scientific or technical report.

### **Teaching methods**

Lectures, exercises and projects

### **Assessment methods**

30 % continuous control during the semester (projet)  
70 % written test during the exam session

### **Resources**

#### **Moodle Link**

- <https://go.epfl.ch/ENG-420>