

ENV-320

**Physics and chemistry of the atmosphere**

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Cursus	Sem.	Type
Environmental Sciences and Engineering	BA6	Obl.
HES - SIE	E	Obl.
Mineur STAS Russie	E	Opt.

Language of teaching	English
Credits	5
Session	Summer
Semester	Spring
Exam	Written
Workload	150h
Weeks	14
<b>Hours</b>	<b>6 weekly</b>
Courses	3 weekly
Exercises	2 weekly
Project	1 weekly
<b>Number of positions</b>	

**Summary**

The course provides an introduction to the physical and chemical processes that govern the atmospheric dynamics at small and large scales. The basis is laid for an in depth understanding of our atmospheric environment and the climate system.

**Content**

- Atmospheric Thermodynamics
- Large Scale Atmospheric Motion
- Radiative Transfer in the Atmosphere
- Energy Balance
- Atmospheric Boundary Layer
- Weather and Climate Systems
- Tropospheric and stratospheric ozone
- Aerosols and clouds
- Homogeneous and heterogeneous reaction classifications and rate expressions
- Gas-particle mass transfer
- Collision theory for molecules, particles, and hydrometeors
- Atmospheric Measurements and Instruments

**Keywords**

Atmospheric Physics, Atmospheric Chemistry, Radiative Transfer, Weather, Climate, Aerosols, Clouds, Ozone, Air Pollution, Boundary Layer, Energy Balance, Nucleation

**Learning Prerequisites****Required courses****Important concepts to start the course**

- Differential, integral, and vector calculus
- Linear algebra
- Basic physics (Momentum Conservation, Dynamics)
- Basic chemistry (reaction rates, chemical thermodynamics)

### Learning Outcomes

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

- Compute simple atmospheric quantities
- Explain atmospheric phenomena
- Interpret atmospheric observations
- Describe fate and transport of atmospheric constituents
- Identify similarities with other environmental fields
- Categorize important atmospheric scales

### Transversal skills

- Assess one's own level of skill acquisition, and plan their on-going learning goals.
- Use a work methodology appropriate to the task.
- Access and evaluate appropriate sources of information.

### Teaching methods

Lectures, Exercises, Laboratory (Practical work)

### Expected student activities

Attending lectures and participation in laboratory  
Complete exercises and practical work  
Studying (written) course material

### Assessment methods

Written exam (55%)  
Exercise assignments (40%)  
Laboratory participation and report (5%)

### Supervision

Office hours	Yes
Assistants	Yes
Others	Prof. Lehning: Thursday from 14:00 to 16:00 Teaching Assistants: 1 full day (tbd)

### Resources

#### Bibliography

John M. Wallace and Peter V. Hobbs: Atmospheric Science, An Introductory Survey

#### Ressources en bibliothèque

- [Atmospheric Science / Wallace](#)

#### Références suggérées par la bibliothèque

- [Atmospheric science / Wallace](#)

**Notes/Handbook**

See Moodle

**Moodle Link**

- <http://moodle.epfl.ch/course/view.php?id=13910>

**Prerequisite for**

Air Pollution and Climate Change