ENV-320

Physics and chemistry of the atmosphere

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

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

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 Measurments 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

Recommended courses

ENV-200, ENV-221, ENG-272

Important concepts to start the course

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

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 mandatory participation in laboratory
Complete exercises and practical work (computer projects and lab report)
Studying provided and indicated course material

Assessment methods

Written exam (55%)
Exercise assignments (35%)
Graded project report (10%)

Supervision

Office hours	Yes
Assistants	Yes
Forum	No
Others	Prof. Lehning: Thursdays (hours tbd) Prof. Takahama: (hours tbd) 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