ENV-320  

Physics and chemistry of the atmosphere  
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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

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%)
Laboratory participation and 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
Références suggérées par la bibliothèque

- Atmospheric science / Wallace

Notes/Handbook

See Moodle

Moodle Link


Prerequisite for

Air Pollution and Climate Change