UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Atmospheric Chemistry

2526-2-F7501Q049

Aims

ObjectiveKnowledge on chemical in the natural and anthropized atmosphere and the effect of human activity.

Knowledge and understanding
At the end of the course the student knows:
The main reactions of the compounds present in the atmosphere compartment, the radical reactions;
The chemical and physical quantities useful for assessing the concentrations of atmospheric micro-pollutants;
Processes of formation and removal of stratospheric and tropospheric ozone
The formation processes and the chemical composition of particulate matter (PMx)
The processes of transport and reactivity of chemical compounds in the atmosphere
The processes that regulate the environmental concentrations of atmospheric pollutants in indoor/outdoor environments and their relationships and the effect on human health

Applied knowledge and understanding
At the end of the course the student is able to:
Calculate the life time and half-life of the compounds present in the atmosphere and predict their reactivity.
Determine tropospheric ozone concentrations
Determine the concentrations and sources of PMx

Autonomy of judgment
At the end of the course the student is able to:
Identifying which chemical compounds present in the atmosphere can have an impact on the environment and on humans.
Identify strategies for controlling air pollutants.
Examine the chemical and physical quantities useful for assessing the concentrations of atmospheric micro-pollutants
Define atmospheric transport processes.

Communication skills

Knowing how to expose the main chemical reactions of anthropogenic and natural compounds and transport processes in the atmosphere compartment in a clear and synthetic manner and with language properties.

Ability to learn
Knowing how to apply the acquired knowledge of atmospheric chemistry to determine the tropospheric ozone concentrations d of PMx. Understand the arguments present in the scientific literature of the chemistry of the atmosphere both past and present.

Ability to perform measurements and understand the data
Students will conduct measurements with cutting-edge scientific instrumentation through laboratory activities regarding the chemical composition of the atmosphere, PM sampling, stack emissions, climate measurements, interaction with ambient humidity and hygroscopicity of particles

Contents

To furnish knowledge and methodological bases to analyse the factors that regulate and determinate air quality both in remote and anthropized areas and their effects on the environment and human health. The capability to reach a high level of data analysis.

Detailed program

Atmosphere composition. Reactive oxygen compounds generated by photochemistry; primary contaminants, their inventory; secondary contaminants, their formation and transformation. Oxidative power of the troposphere. Ozone. Local and global effects of the atmosphere chemical reactivity.

Chemical reactions in the stratosphere. Contamination from CFC. Organo-allogeneic compounds.

Atmospheric particulate in troposphere: its dimensional distribution, the PMx. Chemical composition of the atmospheric particulate. Long-range transport, Nucleation coagulation, condensation, adsorption and evaporation processes. Deposition processes. Interaction of particulate matter with water vapour and its hygroscopicity. Mie theory, remote sensing applications to atmospheric chemistry and aerosol climate forcing.
Effects of air pollutants on the environment, on cultural heritage and on human health.

Prerequisites

Knowledge of environmental, inorganic and organic chemistry

Teaching form

- Lessons, 4 credits - 32 hours, in person, Delivered Didactics also by videoconferences and recorded
- Laboratory experiences, 2 credits - 20 hours, in person, Interactive Teaching

The course will be in English is required by the incoming foreign students

Textbook and teaching resource

The teaching material will be available on the e-learning platform. The official course slides will be in English.

Suggested reading:
Seinfeld, John H. ; Pandis, Spyros N., Atmospheric Chemistry and Physics - From Air Pollution to Climate Change (3rd Edition). John Wiley edition

Semester

first semester

Assessment method

Oral examination

The exam consists in the evaluation of the knowledge acquired by the student in the field of atmospheric chemistry, with particular attention to the organic compounds of volumetric, tropospheric O? and particulate matter and its effects on the environment, climate, human health, clutural heritage and anthropic manufacts.

In the oral examination, the student will be assessed on the basis of the following criteria: 1) knowledge and understanding; 2) connection of the different concepts; 3) reasoning autonomy; 4) ability to use scientific language

Mark range: 18-30/30 with laude

Office hours

Prof. Luca Ferrero receives the students by appointment via e-learning or by email:
luca.ferrero@unimib.it

Sustainable Development Goals

GOOD HEALTH AND WELL-BEING | SUSTAINABLE CITIES AND COMMUNITIES | CLIMATE ACTION