



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## SYLLABUS DEL CORSO

### Chimica dell'Atmosfera

2324-2-F7501Q049

---

#### Aims

**Objective** Knowledge 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 of tropospheric ozone
- The formation processes and the chemical composition of PM<sub>x</sub>
- The processes of transport and reactivity of chemical compounds in the atmosphere

#### 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 PM<sub>x</sub>

#### 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 and of PM<sub>x</sub>. Understand the arguments present in the scientific literature of the chemistry of the atmosphere both past and present.

### **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

### **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 PM<sub>x</sub>. 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 chemistry

### **Teaching form**

- Lessons, 4 credits - 32 hours
- Laboratory experiences, 2 credits - 20 hours

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<sub>3</sub> and particulate matter and its effects on the environment.

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 by email:

luca.ferrero@unimib.it

## **Sustainable Development Goals**

CLIMATE ACTION

---