GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2024-2025

Environmental Chemistry and Analysis: Atmospheric Processes (I002587)

Course size *(nominal values; actual values may depend on programme)*

Credits 5.0 **Study time 150 h**

Course offerings and teaching methods in academic year 2024-2025

A (semester 1)	English	Gent	excursion
			practical
			lecture
			seminar

Lecturers in academic year 2024-2025

Walgraeve, Christophe	LA24	lecturer-in-charge
Demeestere, Kristof	LA24	co-lecturer

Offered in the following programmes in 2024-2025	**crdts**	**offering**
Master of Science in Environmental Science and Technology	5	A
Exchange Programme in Bioscience Engineering: Chemistry and Bioprocess Technology (master's level)	5	A
Exchange Programme in Bioscience Engineering: Environmental Technology (master's level)	5	A

Teaching languages

English

Keywords

air, atmospheric contaminants, particulate matter, (semi-)volatile organic compounds, ozone depletion, greenhouse effect, ozone formation, acid rain, odour nuisance, chemical analysis, fate, behaviour

Position of the course

The course is designed for Master students to understand the chemical fundamentals of atmospheric processes and their perturbation through the involvement of (in)organic contaminants. The course fits within the cluster 'Environmental diagnostics' of the Master program. Focus is put on the chemical trace analysis, fate and physical-chemical behaviour of main groups of contaminants, with attention to partitioning among the different environmental matrices and chemical reactivity.

Contents

A. Introduction

1. Structure and properties of the atmosphere

B. Chemistry

1. Stratospheric chemistry: the ozone layer
2. The ozone holes
3. The chemistry of ground-level air pollution
4. The greenhouse effect
5. Toxic organic compounds

C. Analysis: focus on (semi-)volatile organic compounds

1. Introduction to the analysis of gaseous pollutants
2. Introduction to the analysis of particulate matter

For both types of airborne contaminants, the analytical sequence from sampling to identification and quantification will be discussed; and the principles behind common sample preparation and instrumental separation and detection techniques (e.g. gas and liquid chromatography, mass spectrometry) will be explained.

Initial competences

Bachelor of Science level knowledge of inorganic and organic chemistry

Final competences

1 Understand the chemistry of natural atmospheric processes
2 Having a profound knowledge on the impact of anthropogenic emissions on atmospheric processes
3 Understand the physical-chemical behavior of atmospheric contaminants in the environment
4 Have knowledge of the basics and operational principles of chemical analytical techniques
5 Understand how chemical analytical methods are applied to identify and quantify trace contaminants in air

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Seminar, Excursion, Lecture, Practical

Extra information on the teaching methods

During plenary lectures, theory and fundamentals about atmospheric processes, the chemistry of air pollution, and chemical-analytical methods for airborne trace compounds are discussed. To allow the students to master the concepts introduced in the course, lab practicals and coached exercises are organized focusing on analytics and environmental behaviour of atmospheric contaminants. In order to illustrate the theory in practice, guided company visit(s) are organized.

Study material

Type: Handbook

Name: Environmental Chemistry 5th Edition, 2012 by Colin Baird & Michael Cann
Indicative price: € 100
Optional: no
Language : English
Author : Colin Baird & Michael Cann
ISBN : 978-1-46411-349-9
Number of Pages : 736
Oldest Usable Edition : 5Ed
Online Available : Yes
Available in the Library : No
Available through Student Association : Yes
Usability and Lifetime within the Course Unit : intensive
Usability and Lifetime within the Study Programme : regularly
Usability and Lifetime after the Study Programme : regularly
Additional information: Additional information and supporting learning material is provided through Ufora. Lectures are not recorded.

Type: Syllabus

Name: syllabus partim ANALYSIS
Indicative price: € 5
Optional: no
Language : English
Oldest Usable Edition : 2024-2025
Available on Ufora : No
Online Available : No
Available in the Library : No
Available through Student Association : No
Additional information: A syllabus is available. Additional information and supporting learning material is provided through Ufora. Lectures are not recorded.

Type: Syllabus

Name: Syllabus coached theoretical and lab exercises for Partims ANALYSIS & CHEMISTRY
Indicative price: € 5
Optional: no
Language : English
Number of Pages : 100
Oldest Usable Edition : Updated every year
Available on Ufora : No
Online Available : No
Available in the Library : No
Available through Student Association : No

Type: Slides

Name: Slides of Partim ANALYSIS & CHEMISTRY
Indicative price: Free or paid by faculty
Optional: no
Language : English
Oldest Usable Edition : Updated every year
Available on Ufora : Yes
Online Available : No
Available in the Library : No
Available through Student Association : No
Additional information: Students must print the slides themselves and bring them to class.

References

Environmental Chemistry (80-90 Euro) 5th Edition, 2012 by Colin Baird & Michael Cann

Course content-related study coaching

Students are encouraged to actively participate during the lectures and practical exercises. During exercises, students are coached in small groups by the assisting personnel of the department. The lecturers can be contacted after each plenary lecture for additional explanation or questions.

Assessment moments

end-of-term and continuous assessment

Examination methods in case of periodic assessment during the first examination period

Written assessment

Examination methods in case of periodic assessment during the second examination period

Written assessment

Examination methods in case of permanent assessment

Participation, Assignment

Possibilities of retake in case of permanent assessment

examination during the second examination period is not possible

Extra information on the examination methods

Written exam (theory and exercises): students are evaluated on their knowledge and insights of the chemical background of atmospheric processes and of the analysis and physical-chemical behaviour of air contaminants.
Presence and active participation during the coached excercises, the practical sessions in the lab and excursions is obligatory. A report has to be submitted after the practicals.

Calculation of the examination mark

Periodic evaluation: 85%; continuous assessment: 15%
Students who eschew period aligned and/or non-period aligned evaluations for this course unit may be failed by the examiner. This implies for instance that not actively participating in all (lab) exercises and excursions related to this course or a late submission of the reports, can result in failing for this course (i.e. the final mark will be set at 7/20 if mathematically a higher score is obtained).