GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2019-2020

Environmental Chemistry (O000129)

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

Credits	5.0	Study time	150 h
Contact hrs	60.0 h		

Course offerings and teaching methods in academic year 2019-2020

A (semester 2)	English	lecture: plenary exercises	12.0 h
		practicum	12.0 h
		lecture	24.0 h
		seminar: coached exercises	12.0 h

Lecturers in academic year 2019-2020

Heynderickx, Philippe	KR01	lecturer-in-charge

Offered in the following programmes in 2019-2020	crdts	offering
Bachelor of Science in Environmental Technology	5	A
Bachelor of Science in Food Technology	5	A
Bachelor of Science in Molecular Biotechnology	5	A
Joint Section Bachelor of Science in Environmental Technology, Food Technology and Molecular Biotechnology	5	A

Teaching languages

English

Keywords

Pollutants, soil, water, air, equilibrium (complexation) reactions, VOC, environmental

Position of the course

Relying on knowledge acquired in general and organic chemistry elements from soil chemistry, aquatic chemistry and atmospheric chemistry are combined in a quantitative treatment of chemical processes, equilibria and reaction dynamics in the environment. The source, nature and properties of organic and inorganic contaminants are reviewed and applied in the study of their behaviour in air, water, soil and ground water, and of their disrupting effects and eventual measures. Current issues such as acid rain, acidification of oceans, prevention methods for air pollution (chemical aspect), and toxic metals ... are discussed.
Typical applications of environmental chemistry in daily society are included (municipal waste treatment, introduction to waste water treatment plants, C/N/O cycles, fertilizers for agricultural purpose ...)

Contents

· *Introduction*
· *Chemical equilibria and reaction kinetics in soil and water*
· *Equilibria in solid, liquid and gas phases*
· *Carbonate equilibria*
· *Hydrated oxides of iron*
· *Sulphides*
· *Complexation reactions*
· *Role of kinetics in environmental biogeochemistry*
· *Chemical pollutants: source, behaviour, disrupting effects and measures*
· *The distribution of compounds in different environmental compartments*
· *Henry's Law constant, octanol-water partition coefficient and applications*
· *Halogenated solvents and ground water pollution*
· *Trihalomethanes in drinking water*
· *CFCs and breakdown of the ozone layer*

· VOCs and problems of tropospheric ozone formation
· PCBs and dioxines
· Polycyclic aromatic hydrocarbons (PAH)
· Acid deposition
· Phosphates and nitrogen: eutrophication
· Fluorine
· Cyanides
· Trace metals in soils and sediments
· Adsorption/desorption; precipitation/dissolution, complex formation
· Cadmium, mercury, lead, arsenic, chromium
· Sulphur (SO_2) pollution
Element cycles (C, O, Fe, N, S, P), fertilizers
Exercise sessions: putting chemical equilibriain to practice using Excel®
Practical sessions: determination of total hardness (tap water, river water), determination of soil organic matter (Winkler analysis), determination of $CaCO_3$ in soil

Initial competences

Inorganic Chemistry 1: Structure of Matter; Inorganic Chemistry 2: Reactivity of Matter; Organic Chemistry 1: Structure and Reactivity; Chemical Analytical Methods

Final competences

Knowledge and insight in environmental chemistry, in particular chemical processes and disruption by inorganic and organic pollutants.

Conditions for credit contract

Access to this course unit via a credit contract is unrestricted: the student takes into consideration the conditions mentioned in 'Starting Competences'

Conditions for exam contract

Access to this course unit via an exam contract is unrestricted

Teaching methods

Lecture, practicum, lecture: plenary exercises, seminar: coached exercises

Learning materials and price

Course notes (theory and exercises) and slides are available on Minerva platform

References

Environmental organic chemistry/ Schwarzenbach R.P., Gschwend P.M. and Imboden D.M. ISBN 0-471-35750-2.
Syllabus 'Environmental Chemistry' by Prof. Dr. ir. Heynderickx and the references within.

Course content-related study coaching

Professor and assistants have office hours to give a possibility for extra input/explanation/... after the scheduled course hours.

Evaluation methods

end-of-term evaluation and continuous assessment

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

Written examination with open questions, written examination with multiple choice questions

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

Written examination with open questions, written examination with multiple choice questions

Examination methods in case of permanent evaluation

Participation, assignment

Possibilities of retake in case of permanent evaluation

examination during the second examination period is not possible

Extra information on the examination methods

During the first and second examination period, the periodic evaluation accounts for 70% (14/20) for the final score. The non-periodic evaluation takes up 30% (6/20). This non-periodic evaluation consists of 5% for presence and attitude (participation) during lectures and lectures for plenary exercises and coached exercises, 5% for a homework tasks (in groups, such as for the practical sessions or individual) related to exercise classes or to an environmental topic, and for 20% on laboratory reports to be made during the laboratory exercises (Practical + Group work; assignment to be handed in

directly after the lab session). No telephones are allowed during classes.
If the deadline for the homework is not met, the score on the homework will be 0. No excuses can be invoked.
All laboratory practical session reports have to be delivered to the assistant (unless differently announced) at the end of the session and they are scored onto 20 pts; the total is reduced to 4 points for the final result (maximally 4/20). The practical sessions are mandatory to attend.
If students are legally absent for laboratory practical sessions due to sickness, practical session (or a replacing session) has to be taken during the catch-up activity week (week 13 in the semester). Legal absence is justified by legal documents (doctor's note, Korean Army note…), handed in to GUGC Academic Affairs. In any other cases, the session will be scored as 0/20.
The written examination (maximally 14/20) exists of a part open questions (maximally 10/20) and exercises (maximally 4/20).
If different courses collide in the teaching schedule for non-model trajectory students, the course from the year in which the student is enrolled has priority and no special (re) arrangements are made for this student.
To qualify for passing, (1) both the score of the practical session needs to be higher than 2/4 and (2) the total score (= summation of the score for periodic evaluation, maximal 14 pts, laboratory reports, maximal 4 pts, and the participation and homework, maximal 2 pts) needs to be at least 10/20. Students who eschew period aligned and/or non-period aligned evaluations for this course unit may be failed by the examiner.
During the second examination period, the non-periodic evaluation (maximal 6 pts, see upper paragraph) cannot be retaken.

Calculation of the examination mark

5% participation (presence and attitude)
5% homework (smaller tasks as further practice for given exercises)
20% laboratory reports (assignment)
70% written exam with open questions (maximal 10 pts) and written exam with exercises (maximal 4 pts)

Students who eschew period aligned and/or non-period aligned evaluations for this course unit may be failed by the examiner.