UCL Université catholique de Louvain

LBRTE2101

2010-2011

Aquatic and soil biological and physical chemistry

5.0 credits	37.5 h + 15.0 h	1q

Teacher(s) :	Gerin Patrick ; Dufey Joseph ;
Language :	Français
Place of the course	Louvain-la-Neuve
Main themes :	The course aims at training students on physical-chemical and (micro) biological processes that control the functioning water and soil (eco-)systems, whether natural or anthropised. This training aims to prepare students for professional activities connected with the characterisation or management of aquatic or soil environments. The course will describe the main physical and chemical processes taking place in these ecosystems. It will in particular show how the thermodynamic and kinetic principles can be applied to these systems to understand their evolution, particularly taking into account biological catalysis. The main physico-chemical and biochemical parametes used to characterize these systems will be presented. Some processes acting in specific systems (eutrophic water, wastewater treatment, fate of pollutants in soils, ...) will be analyzed by focusing on their interdependencies and how to manage them. The know-how that students have to acquire will rely primarily on structuring and integrating knowledge acquired in chemistry, (micro)biology and engineering in previous years, and on their use to understand the functioning of natural environments or the development of technological systems for water treatment. At the end of the course, each student should be able : - to interpret data concerning the characteristics of an aquatic or a soil system, either natural, polluted or of industrial interest, and deduce the physical, chemical and biological processes that are taking place in this environment. - to analyse an aquatic or soil system and write a report explaining its chemical and biological functioning.
Aims :	Knowledge: - Integrated knowledge of physical, chemical and biological processes that occur in aquatic ecosystems and soil and that affect the functioning and evolution of these ecosystems. Know-how and skills: - Ability to integrate the basic disciplines (chemistry, physics, biology, transfer phenomena, thermodynamics and kinetics) to analyze, understand and explain the phenomena occurring in aquatic systems and soils on the basis of physical-chemical and biological elementary processes. - Ability to propose strategies to master these phenomena and processes to protect or remediate the environment or within industrial processes. *The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".*
Content :	Lectures and exercises: - Recall of basic concepts and contextualized deepening: water - atmospheric gases equilibria, acid-base equilibria, dissolution - complexation, redox (electrons cycles in the biosphere, redox potential in water and soil). - Characterization of water and soil: physico-chemical and biotic parameters - Analysis of the functioning of environmental systems: pollution of aquatic ecosystems (pollution profile, eutrophication), waste water treatment processes (primary, secondary, tertiary purification steps), transfer dynamics of substances in the soil profile (non-reactive solutes, reactive solutes, complexes), chemistry and biochemistry of the rhizosphere and the root. Supervised work: Analysis of the processes occring in aquatic or soil systems (personal work under the supervision of the teachers)
Other infos :	Precursory courses: Inorganic and analytical chemistry; Transfer phenomena; Soil science; Chemical thermodynamics and kinetics; background in biology, biochemistry, microbiology. Supplemental courses: Courses in waste water treatment, industrial chemistry project, final year thesis. Evaluation: written examination and written report on the personal work. Support: reference books: Werner Stumm, James J. Morgan. 1996. Aquatic Chemistry: chemical equilibria and rates in natural waters. 3rd Edition. Wiley-Interscience Publication, John Wiley and Son Inc. ISBN 0-471-51184-6, ISBN 0-471 or Laura Sigg, Werner Stumm, Philippe Behra. 1994. Chimie des milieux aquatiques: chimie des eaux naturelles et des interfaces dans l'environnement. 2d edition. Masson. ISBN 2-225-84498-4.
Cycle and year of study :	> Master [120] in Agricultural Bioengineering > Master [120] in Chemistry and Bio-industries > Master [120] in Environmental Bioengineering

Faculty or entity in charge:	AGRO