

Syllabus – 2017



Spring Semester in Water and Environmental Management

January 17 to May 12, 2017 – All courses are taught in English

Welcome to LaSalle Beauvais-ESITPA, a leading “Grande École”
in Geosciences and Agriculture

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About suggested readings

References beginning with the  symbol are available in the library.

Overview of the program

Topic	Module	Number of hours		
		L	PW	FW
Context	Water : current needs and further challenges	13	9	
	Cross cultural communication		12	
	Water policy and governance	20		
	International seminars	9		
Theoretical and applied sciences	Watershed hydrology	6	15	
	Hydrogeology	9	6	3
	Aquatic chemistry	20	3	
	Environmental biogeochemistry	12	12	
	Soil hydrology	6	12	6
Monitoring and modelling tools	GIS applied to hydrology	2	20	
	Flow and transport in groundwater	12	12	
	Water quality monitoring	3	16	3
Mitigation & conservation	Ecological engineering applied to water management	8	6	10
	Water management across agroecosystems	14	9	
	Water pollution and remediation	15	2	
	Field trip			40

L: Lectures

PW: Practical works in classroom or computer room

FW: Field work

Please note that the number of hours is susceptible to be slightly modified.

2017 schedule

JANUARY		FEBRUARY		MARCH		APRIL		MAY	
1		1	Water policy and governance 2 ECTS	1	Environmental biogeochemistry 2 ECTS	1		1	Labor Day
2		2		2		2		2	Water quality monitoring 2 ECTS
3		3		3		3	Water quality management across agroecosystems 2 ECTS	3	
4		4		4		4		4	
5		5		5		5		5	
6		6	Watershed hydrology 2 ECTS	6	Soil hydrology 2 ECTS	6		6	
7		7		7		7		7	
8		8		8		8		8	V Day
9		9		9		9		9	Water pollution and remediation 2 ECTS
10		10		10		10	Easter holidays	10	Checkout day
11		11		11		11		11	
12		12		12		12		12	
13		13	Winter holidays	13	Hydrogeology 2 ECTS	13		13	
14		14		14		14		14	
15		15		15		15		15	
16		16		16		16		16	
17	Orientation day	17		17		17	Easter	17	
18	Cross cultural communication 1 ECTS	18		18		18	Ecological eng. applied to water management 2 ECTS	18	
19		19		19		19		19	
20		20	Aquatic chemistry 2 ECTS	20	Flow and transport in groundwater 2 ECTS	20		20	
21		21		21		21		21	
22		22		22		22		22	
23		23		23		23		23	
24	Water: current needs and further challenges 2 ECTS	24		24		24	Field trip 2 ECTS	24	
25		25		25		25		25	
26		26		26		26		26	
27		27	Environmental biogeochemistry	27	GIS applied to hydrology 2 ECTS	27		27	
28		28		28		28		28	
29		29		29		29		29	
30	Water policy and governance	30		30		30		30	
31		31		31		31		31	

WE

National Holiday

Classes

International seminars (6 sessions throughout the semester - 1 ECTS)
2 hours per week of French as a Foreign Language courses (2 ECTS)
Exams are usually scheduled the end of the following week

Cross cultural communication (LE0201)

1 ECTS

Developing communication and project management skills in a multi-cultural team

Aim

Raising awareness and developing skills around culture and its impact on behavior in international teams. Students will draw on their own experience of learning within a multi-cultural team immersed in a host culture.

Program

- Culture: definitions, metaphors; key concepts. Culture as a source of intercultural errors
- Cross cultural communication: "Talk to me"
- Managing an international team: "When in Rome ... " (case study; video)
- Cultural perceptions of water case study: description of geographical location, identification of stakeholders, proposal of technical and legal solutions
- Student reports: results of expatriate manager interview
- Student presentations of cross cultural training packages
- Independent/group work on assignments and projects

Learning outcomes

Upon successful completion of the workshop, students will be able to:

- Develop a better understanding of their own culture
- Explain how stereotypes are formed
- Understand how and why miscommunication happens
- Identify cross-cultural and intercultural perceptions of water management issues

Assessment method

Group assignment and oral defense.

Prerequisites

No prerequisite.

Module leader

Martine REY (Ph.D.), Associate Professor, Languages & Cultural Studies.

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Water: current needs and further challenges (AE0201)

2 ECTS

**A geography of water resources and of key issues
to be addressed**

Aim

This module is designed to be an introduction of the Spring Semester. Students will be initiated to the different stakes regarding water management that have to be challenged.

Program

- Basic water needs and implications for human health (water-related diseases)
- Geography of current water resources
- Methodologies to assess current water resources
- Indices of water scarcity
- Water needs by economic activities and by nation level of development
- Current and future threats to water resources (degradation of freshwater ecosystem, contamination, overexploration, climate change, *etc.*)

Learning outcomes

- Discuss the disparity between localization of water needs and of water resources
- Describe the methods to assess water scarcity
- Describe the different threats to water resources


Assessment method

Oral defense of a case study.

Prerequisites

No prerequisite.

Suggested readings

 Brooks, K.N., Folliott, P.F., et Magnier, J.A., 2012. Hydrology and the Management of Watersheds. Wiley-Blackwell, 552 p. ISBN 978-0-470-96305-0.

Module leader

Romain ARMAND (Ph.D.), Associate professor in surface hydrology and GIS.

Contact: romain.armand@lasalle-beauvais.fr

Water policy and governance (AE0202)

2 ECTS

Which instruments allow to supervise water management and to improve water services?

Aim

Water governance is defined by the political, social, economic and administrative systems that are in place, and which directly or indirectly affect the use, development and management of water resources and the delivery of water service delivery at different levels of society (*UNDP*). This module will give to students an overview of water governance: social, economic, politic and environmental dimensions will be studied.

Program

- Stakeholders involved in water use and management
- Territorial management of water
- Water rights and permits
- Water quantity and quality standards
- Tax incentives and credits.
- Conflict resolution

Learning outcomes

- Describe the different stakeholders related to water supply, use and management
- Discuss the different tools to regulate water use and water conservation

Prerequisites

No prerequisites

Assessment method

Poster drawing and oral defense

Module leader

Romain ARMAND (Ph.D.), Associate professor in surface hydrology and GIS.

Contact: romain.armand@lasalle-beauvais.fr

Watershed hydrology (AE0203)

2 ECTS

Which processes are controlling the partition of rainfall?

Aim

The students will be familiarized with the processes explaining the partition of water in several hydrological fluxes (infiltration, runoff, recharge, evaporation). These processes will be studied at the catchment scale. The effect of soil surface state on runoff/infiltration partition will be specifically discussed because anthropogenic activities (crops, farming practices, urbanization, soil sealing, etc.) are permanently affecting the surface conditions and therefore the water fluxes.

Program

- Water cycle
- Rainfall data acquisition (gauges)
- Rainfall losses (interception, storage, infiltration)
- Runoff / infiltration partition
- Morphometric indexes of catchment
- Flood generation
- Water balance at the catchment scale

Learning outcomes

- Explain the surface hydrological processes and how they are affected by soil surface state
- Describe these hydrological processes by means of equations
- Delineate the catchment area based on topographic maps or data
- Interpret rainfall data
- Realize water balance


Assessment method

Written examination.

Prerequisites


No prerequisite.


Suggested readings

 Brooks, K.N., Folliott, P.F., et Magnier, J.A., 2012. Hydrology and the Management of Watersheds. Wiley-Blackwell, 552 p. ISBN 978-0-470-96305-0.

 Hendriks, M., 2010. Introduction to Physical Hydrology. Oxford, 352 p. ISBN 978-0-19-929684-2.

Ponce, V.M., 1989. Engineering Hydrology: Principles and Practices. Prentice Hall College Div, 640 p. ISBN 978-0-13-277831-2.

 Rodda, H., et Little, M., 2015. Understanding Mathematical and Statistical Techniques in Hydrology: An Examples-based Approach. Wiley-Blackwell, 112 p. ISBN 978-1-4443-3549-1.

 Ward, A.D., Trimble, S.W., Burckhard, S.R., et Lyon, J.G., 2015. Environmental Hydrology, Third Edition. CRC Press : 320 p. ISBN 978-1-4665-8941-4.

Module leader

Romain ARMAND (Ph.D.), Associate professor in surface hydrology and GIS.

Contact: romain.armand@lasalle-beauvais.fr

Aquatic chemistry (GE0203)

2 ECTS

How chemical processes are controlling water composition ?

Aim

Across the aquatic system (rivers, oceans, lakes, groundwater), natural water presents differences in its composition. Several processes are driving the chemical composition of water system and their knowledge allows defining the hydrochemical context, based on present species and on geological background. Studying the hydrochemical context is essential to detect chemical anomaly which may indicate pollution.

A focus on chemical data representation will be done.

Program

- Natural water composition
- Chemical data and analysis
- Chemical water composition governing processes
- Natural hydrochemical processes (complexation, redox, hydrolysis, surface reaction)
- Data representation with software (GWB)

Learning outcomes

- Describe the chemical processes affecting water mineral composition
- Discuss how the presence of individual species, and their interactions, will affect the overall chemistry of a complex environmental system
- Represent water mineral composition with specific charts (Piper diagram).

Assessment method

Written examination.

Prerequisites

- Chemistry

Suggested readings

📖 Langmuir, D. (1997) Aqueous Environmental Geochemistry. Prentice Hall, Upper Sadle River, New Jersey.

📖 Stumm, W. and Morgan, J.J. (1996) Aquatic Chemistry, 3rd ed. Wiley Intersciences, New York.

Module leader

Olivier POURRET (Ph.D.), Associate professor in geochemistry. Contact: olivier.pourret@lasalle-beauvais.fr

Environmental biogeochemistry (AE0205)

2 ECTS

Looking at the processes occurring at the earth critical zone

Soils are heterogeneous systems with many important reactions occurring at the interface between solid, liquid and gas phases. The fate of chemicals that impact terrestrial and aquatic systems is controlled largely by their behavior at these interfaces. Soils also constitute a place of interactions with many anthropogenic inputs such as fertilizers. This course focuses on the main soil biogeochemical processes that control the transfer of chemical elements through environment and their consequences on water quality. The course will cover the fundamentals of solute-solid interactions, biogeochemical cycles of elements and impacts of agricultural practices on water quality. Real issues related to the transfer of elements within the soil-water continuum will be explored through independent literature research and class discussion.

Program

- *In situ* moisture and infiltration measurement across different soil and topographic conditions
- Biogeochemical cycles (N, P, Ca, Mg ...) at the earth critical zone
- Factors affecting elements transfer across environment
- Impacts of agricultural N and P inputs on water quality

Learning outcomes

- Characterize biogeochemical cycles and fluxes of elements across different reservoirs using innovative analytical tools (e.g. stable isotopes)
- Discuss how human activities may affect the physical properties of soil and disturb the different steps of biogeochemical cycles
- Discuss how agriculture practices impact water and environmental quality


Assessment method


Oral defense.

Prerequisites

- Introduction to soil science
- Analytical chemistry

Suggested readings

 Botkin, D.B., et Keller, E.A., 2014. Environmental Science: Earth as a Living Planet. John Wiley & Sons, 688 p. ISBN 978-1-118-42732-3.

 Brady, N.C. & Weil, R.R., 2002. The nature and properties of soils. Prentice Hall, 960 p. ISBN 978-0-13-016763-7.

Module leader

David HOUBEN (Ph.D.), Associate professor in soil science and biogeochemistry.

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Soil hydrology (AE02XX)

2 ECTS

How to determine the fate of water in the soil-water continuum?

Aim

Soils are heterogeneous systems with many important reactions occurring at the interface between solid, liquid and gas phases. The soil physics (structure, moisture) determine the balance between runoff and infiltration and thus control the variability of streams flow and of groundwater table level. This course focuses on the main soil physical processes that control the transfer of water in the soil profile.

The course will cover the fundamentals of soil water movements in the soil, especially through direct measurements on the field.

Program

- Soil Physics
- Soil moisture content
- Soil moisture characteristics, pF curve
- Water movements in the soil porous media (total potential)
- Unsaturated water flow
- Equations for ponded infiltration
- *In situ* moisture and infiltration measurement across different soil and topographic conditions

Learning outcomes

- Prepare a campaign of soil sampling
- *In situ* measurements and calculation of main physical properties of soil (bulk density, soil moisture, infiltration)
- Understand what factors and processes are controlling the fate of rainfalls into the soil
- Discuss how agriculture practices impact water movements in the soil


Assessment method


Group assignment.

Prerequisites

- Introduction to soil science

Suggested readings

 Ashman, M.R. & Puri, G., 2002. Essential soil science: a clear and concise introduction to soil science. Oxford, 198 p. ISBN 978-0-632-04885-4.

 Brady, N.C. & Weil, R.R., 2002. The nature and properties of soils. Prentice Hall, 960 p. ISBN 978-0-13-016763-7.

 Hendriks, M., 2010. Introduction to Physical Hydrology. Oxford, 352 p. ISBN 978-0-19-929684-2.

Module leader

Romain ARMAND (Ph.D.), Associate professor in surface hydrology and GIS.

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Hydrogeology (GE0202)

2 ECTS

How to determine the physical properties of an aquifer ?

Aim

Groundwater constitutes a major water resource, especially for countries located in arid and semi-arid contexts. Student will be familiarized with theoretical knowledge of aquifers properties (which determine the water flows) and with field methods, thanks to our well field close to the campus and of our newly developed hydrogeology facilities.

This module is designed to give a very practical introduction to “Flow and transports in groundwater”.

Program

- Aquifers typology (porous, fractured, karst, coastal) and geography
- Hydrodynamic parameters of aquifers: permeability, transmissivity, diffusivity.
- Groundwater hydraulics
- Assessment of aquifer recharge
- Issues regarding aquifers (subsidence, seawater intrusion, pollution, *etc.*)
- Piezometric and sampling campaign around the on-site hydrogeology platform

Learning outcomes

- Describes the different types of aquifer and the impact on hydrodynamic parameters
- Discuss the susceptibility to issues, according to physical and geographical information
- Realize basic monitoring operations: depth measurement, water sampling.
- Solving exercises: compute water flow between two wells, draw piezometric map and assess the direction of water flow

Assessment method

Written examination.

Prerequisites

No prerequisite.

Suggested readings

📖 Hendriks, M., 2010. Introduction to Physical Hydrology. Oxford, 352 p. ISBN 978-0-19-929684-2.

📖 Karamouz, M., Ahmadi, A., et Akhbari, M., 2011. Groundwater hydrology: engineering, planning, and management. CRC Press, 649 p. ISBN 978-1-4398-3756-6.

Module leader

Lahcen Zouhri (Ph.D.), Associate professor in hydrogeology.

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Flow and transport in groundwater (GE0204)

2 ECTS

[This module may have some changes in 2017]

Aim

The fate of pollutants that enter the subsurface is determined by physical, chemical, and biological processes. Depending on the relative significance of these processes, the pollutants may spread in the subsurface, may be kept in place and rendered immobile and/or may be transformed into other substances. We will introduce these processes, explain their physical basis, describe their effects, provide governing equations, and develop solutions for simple situations. Conceptual model development, numerical model implementation and model calibration will be discussed in order to examine specific flow and transport applications. Exercises and practice will be alternated to support the concepts discussed in the course.

Program

- Transport processes: advection, diffusion, dispersion
- Mass transfer processes: adsorption, precipitation, radioactive decay, biodegradation, inactivation
- Reactive transport: equilibrium and non – equilibrium model, competitive and chain reaction
- Flow and transport governing equations and boundary conditions.
- Modeling the transport of contaminants through preferential flow paths: dual porosity model, transport in fractured porous media
- Modeling seawater intrusion in coastal aquifers: density dependent groundwater flow and contaminant transport.
- Conceptual model development using borehole data, cross-sections and aquifer test analysis
- Flow and transport model development, model calibration, choice of appropriate boundary conditions.
- Discussion on test cases and on reliability of results.

Learning outcomes

- Describe how the contaminants migrate in the groundwater
- Discuss the physical processes and the modeling techniques that govern the fate of contaminants in aquifers.
- Apply techniques, skills and tools necessary to resolve flow coupled with contaminant transport problems

Prerequisites

- Aquatic chemistry
- Hydrogeology

Assessment method

Exam in computer classroom.

Module leader

Romain ARMAND (Ph.D.), Associate professor in surface hydrology and GIS. Contact: romain.armand@lasalle-beauvais.fr

GIS applied to hydrology (AE0204)

2 ECTS

How to create synthetic maps to obtain an accurate overview of watershed management?

Aim

Geographical Information Systems (GIS) are software commonly used to study water issues on a wide range of topics (watershed management, groundwater, floods, *etc.*). GIS constitute a focal tool which aggregates data from different sources and scales. In this module, students will be initiated to the ArcGIS software and to general GIS files (vectors, rasters and tables). Basic skills will be taught (data handling, mapping) and a focus will be done on the use of hydrological dataset.

The module will be designed to facilitate future use of other GIS than ArcGIS software.

Program

- Introduction to the different types of data
- Software basic handling
- Realization of a map: which information should be provided?
- Extraction of dataset from web libraries (USGS)
- Use of elevation dataset (SRTM)
- Creation of topographical and hydrological raster files: slope, indexes (Beven-Kirkby, TPI), catchment delineation, direction and accumulation flow, stream network generation
- Export (other GIS, web-based solutions)
- Use of GPS device and import into the software
- Application to watershed management and water resources management

Learning outcomes

- Describe the different GIS data
- Realize maps
- Create hydrological data from elevation dataset
- Search and download on-line free dataset


Assessment method

Exam on computer.

Prerequisites

No prerequisites

Suggested readings

 Dixon, B., et Uddameri, V., 2015. GIS and Geocomputation for Water Resource Science and Engineering. Wiley-Blackwell: 504 p. ISBN 978-1-118-35413-1.

Module leader

Romain ARMAND (Ph.D.), Associate professor in surface hydrology and GIS. Contact: romain.armand@lasalle-beauvais.fr

Water management across agroecosystems (AE0207)

2 ECTS

**How to adapt farming practices to reduce
agricultural impacts on water quality?**

Aim

Agricultural practices, especially the use of nutrients and plant-health products, can degrade chemical quality of surface water and of groundwater. This module is designed to provide an agronomy background to students to understand how farmers may conciliate their yield goals, crop needs and water quality. A focus on major nutrients (nitrates and phosphorus) will be done.

This theoretical knowledge will be applied to the Pisa floodplain (Italy) where different crop systems or land use managements are tested to identify the impacts of farming practices on water quality. This area is illustrative of Mediterranean coastal areas periurban dynamics (urban sprawl, land abandonment).

Program

- Introduction to agronomy
- Nutrient balance
- Regulatory context of farming practices regarding water quality
- Overview of agro-environmental measures in the EU
- Hydrology applied to agroecosystems
- Fate of phosphorus: anthropogenic and natural sources; transfer and impact on water quality
- Use of spatialized modelling tools

Learning outcomes

- Describe the interaction between farming practices and water quality
- Describe the agro-environmental measures that may be used to conserve water quality
- Realize a nutrient balance


Assessment method


Written examination.

Prerequisites

- Aquatic chemistry
- Soil hydrology
- Environmental biogeochemistry

Suggested readings

 Botkin, D.B., et Keller, E.A., 2014. Environmental Science: Earth as a Living Planet. John Wiley & Sons, 688 p. ISBN 978-1-118-42732-3.

 Brady, N.C. & Weil, R.R., 2002. The nature and properties of soils. Prentice Hall, 960 p. ISBN 978-0-13-016763-7.

Module leader

Elisa MARRACCINI (Ph.D.), Associate professor in agronomy and geo-agronomy.

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Ecological engineering applied to water management (AE0206)

2 ECTS

What are applications of wetland ecosystems and functional plant traits in ecological engineering?

Aim

In this module, students will be familiarized with ecological engineering, in particular influence of plant species diversity and plant traits on the physical and biogeochemical processes of water and nutrient flows. Natural areas such as wetlands will be particularly studied as they are high biodiversity ecosystems and present functions in water protection. Therefore, wetlands are particularly focused by stakeholders and are concerned by conservation measures.

Land planning is now enhanced by the possibilities of plant-based engineering. Artificial wetland may be used for wastewater phyto-treatment technologies. Runoff and erosion in agricultural catchments can be reduced by herbaceous hedges inspired by plant morphology and other properties.

Program

1- Wetland ecology and applications in ecological engineering for water protection and treatment

- Ecosystem services of wetlands
- Impact of wetlands on water quality (nitrate and phosphate removal)
- Wetland reconstruction or restoration to improve water protection
- Visit: waste water treatment plant based on plant-based engineering

2. Plant functional ecology and applications in ecological engineering to reduce runoff and erosion

- Effect of plant traits on efficiency of herbaceous hedge to concentrated runoff
- Effect of cover crops (e.g. multispecies cover crops) on runoff generation and erosion
- 1 day field trip: Pays de Caux (agricultural area strongly affected by runoff issues)

Learning outcomes

- Describe the functional role of different types of plants in wetlands
- Describe the key processes of importance for nutrient removal in wetlands
- Discuss the choice of techniques to reduce the impacts of runoff through a case study


Assessment method


Individual assignment.

Prerequisites

No prerequisite.

Suggested readings

 Botkin, D.B., et Keller, E.A., 2014. Environmental Science: Earth as a Living Planet. John Wiley & Sons, 688 p. ISBN 978-1-118-42732-3.

 Morgan, R.P.C., 2005. Soil Erosion and Conservation. Wiley-Blackwell, 316 p. ISBN 978-1-4051-1781-4.

Module leader

Michel-Pierre FAUCON (Ph.D.), Associate professor in plant ecology.

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Field trip (AE0209)

2 ECTS

Study and visit of sites presenting specific water management facilities

Program

Program of field trip is still under construction. In 2016, the field trip took place in Alsace, at the eastern border of France. Several case study were visited with invited speakers:

- The impacts of the Rhine channelization on the sediment supply and the dynamic of riparian ecosystems.
- The land planning of Strasbourg city related to the Rhine dynamics (bike tour).
- Soil conservation and mitigation of erosion of agricultural lands in hilly areas.



An insight of the field trip can be read on : <http://arcg.is/1OTOBhU> (in French).

Prerequisites

No prerequisites.

Assessment method

Group assignment and oral defense.

Module leader

Romain ARMAND (Ph.D.), Associate professor in surface hydrology and GIS.

Contact: romain.armand@lasalle-beauvais.fr

Water quality monitoring (AE0208)

2 ECTS

How to assess the ecological and physico-chemical quality of water systems?

Aim

Determining water quality is a key question in the EU where Water Framework Directive (WFD) aims at achieving an ecological and chemical “good status” of all water bodies. In this module, we will focus on superficial water bodies (e.g.: rivers and lakes) and the way to assess the status of their biological and physico-chemical status by means of sampling, indicators and laboratory analysis. Anthropogenic perturbations (sewage effluents, agricultural practices) and their effects on water quality will be particularly studied.

Stream station(s) near Beauvais will be used to perform water and biological samples.

Program

- Animal and vegetal bio-indicators
- Review of water biological quality indexes
- In-site physico-chemical measurement (multiparametric probe)
- Macro-invertebrates sampling in stream stations near Beauvais
- Recognition of the taxonomic rank of sampled macro-invertebrates
- Determination of biological index of the selected stream station(s)
- Lab measurements of physico-chemical parameters (pH, Nitrate, Chlorine, etc.)
- Introduction to sensors involved in monitoring of water properties

Learning outcomes

- Explain the location of the sampling site depending on expected anthropogenic perturbation
- Assessing first ecological level of a water system
- Measuring basic physico-chemical parameters of water samples
- Discuss the effects of environmental and anthropogenic factors on biological index or physico-chemical parameters


Assessment method

Group assignment.

Prerequisites

- Aquatic chemistry

Suggested readings

 Martin, J.L., 2014. Hydro-Environmental Analysis: Freshwater Environments. CRC Press, Boca Raton : 567 p. ISBN 978-1-4822-0607-4.

Module leader

Anne-Maïmiti MERCADAL (Ph.D.), Associate professor in animal ecology.

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Water pollution and remediation (GE0205)

2 ECTS

How to characterize a water pollution and propose specific remediation techniques?

Aim

Preventing and controlling pollution of the environment is a major challenge facing both developed and developing countries. In this module, students will be initiated to the major environmental pollutants and to the current methods used to control soil and water pollutions.

Program

- Different types of organic and inorganic contaminants in surface water and groundwater
- Document review of a contaminated site
- Diagnostis of a contaminated site
- Management process of contaminated site
- Remediation techniques of contaminated water and soils

Learning outcomes

- Describe the different types of contaminants and their behavior in surface water and in groundwater
- Based on document review, summarise the key factors and processes that are controlling pollution
- According to site context, discuss the choice of the most accurate remediation technique

Prerequisites

- Aquatic chemistry
- Water flow and transport

Suggested readings

📖 Appelo, C.A.J. and Postma, D. (1999) Geochemistry, groundwater and pollution. A.A. Balkema, Rotterdam.

Assessment method

Oral defense.

Module leader

Olivier POURRET (Ph.D.), Associate professor in geochemistry.

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International seminars (AE0210)

1 ECTS

International point of view about water and environmental management

Aim

As spring program is limited to 4 months, the seminars provide opportunity to raise new topics and give prime examples of water management. The seminars will be given by professors from partner universities or specialists from public and private institutions.

Program

Program is still under construction, it may include:

- Mapping the agricultural use of soils based on remote sensing analysis.
- How increase agriculture tolerance to drought and soil salinization?
- New technics of water depollution
- Integrating climate change in management plans of water basin area
- How to monitor and reduce water consumption thanks to digital techs?
- How to feed growing cities with fresh water in semi-arid context?

Prerequisites

No prerequisites.

Assessment method

Attendance to the seminar.

Module leader

Romain ARMAND (Ph.D.), Associate professor in surface hydrology and GIS.

Contact: romain.armand@lasalle-beauvais.fr

French as a Foreign Language (LE0202)

2 ECTS

Discovering French language

Aim

This module is designed for students who have had little or no previous French instruction. Students will discover French and acquire some basic tools for real-life language use while they study and travel in France.

Class will be conducted entirely in French, and students will be expected to participate actively, using the language skills they are learning inside and outside the classroom. In the end, students are encouraged to pursue the study of French once they return to their home institutions.

Program

- Describe, narrate, and ask/answer questions in the foreign language in the present time about a variety of topics related to family, daily activities, eating, and traveling.
- Comprehend the foreign language with sufficient ability to grasp the main idea in short conversations pertaining to the topics mentioned above.
- Read and understand the main idea and some details of materials related to daily life and travel (maps, classified ads,)
- Write sentences and short paragraphs on familiar topics relating to personal interests and practical needs. (e.g. postcards)

Prerequisites

No prerequisite.

Assessment method

Written examination.

Module leader

Martine REY, Associate Professor, Languages & Cultural Studies.

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Example of a transcript of academic record

TRANSCRIPT OF ACADEMIC RECORD

ACADEMIC YEAR

To whom it may concern

Student:

Home University:

Host University:

Period of study:

Water Spring Semester

Course	ECTS* credits per course	Result / 20	ECTS* credits obtained	Grade
WATER : CURRENT NEEDS AND FURTHER CHALLENGES				
WATER POLICY AND GOVERNANCE				
SURFACE HYDROLOGY				
HYDROGEOLOGY				
AQUATIC CHEMISTRY				
SOIL HYDROGEOCHEMISTRY				
GIS APPLIED TO HYDROLOGY				
ECOLOGICAL ENGINEERING APPLIED TO WATER MANAGEMENT				
FLUID MECHANICS APPLIED TO HYDROGEOLOGY				
FLOW AND TRANSPORT IN GROUNDWATER				
WATER QUALITY MONITORING				
WATER QUALITY MANAGEMENT ACROSS AGROECOSYSTEMS				
WATER POLLUTION AND REMEDIATION				
FIELD TRIP				
INTERNATIONAL SEMINARS				
FRENCH AS A FOREIGN LANGUAGE				
TOTAL ECTS* CREDITS OBTAINED				

* 2 ECTS = 1 US CREDIT

Romain ARMAND
Coordinator

Valerie LEROUX
Dean