TU1 CHALLENGES IN WATER SCIENCES

2023-24 / S3

Director:

Bjoern Wissel
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Training:

Master

ECTS:

3

Volume horaire (h) :

15 CM + 12 TD

Teaching language:

English

Update:

12/10/2023

Objectives

To provide the basis about global water cycle, hydrosystem functioning and associated challenges.

Content

The course is organized into three modules. Module one (6h) focuses on the global water cycle and associated energy and mass flows, and discuss the resulting patterns and control of water quality and quantity (availability). Current and future challenges to water will be put into the context of Sustainable Development Goals developed by United Nations.
Module two (5h) covers the major categories and functioning of different hydrosystems, such as rivers, lakes, wetlands, groundwater and virtual water.
The purpose of module three (4h) is to discuss water challenges at the watershed level, identify threats to major rivers, and discover the unique specificities of urban waters.
During the practicals (12h) students work in groups to synthesize the literature related to selected water challenges covered in the three modules. Results are shared with the class in the form of a report and an associated presentation.

Methods / Teaching activities

Lectures, seminars (foreing reserachers and practitioners), group work, literature analysis.

Evaluation modalities

A literature report (group, 30%), a presentation on the report (group, 20%), and a final exam (written, 50%).

Prerequisites

NA

Competences

tbc

Teachers / Speakers

B. Wissel (Univ. Lyon 1); academic and practitioner (tbc)

TU1 CHALLENGES IN WATER SCIENCES

2023-24 / S3

Director:

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Training:

Master

ECTS:

3

Volume horaire (h) :

15 CM + 12 TD

Teaching language:

English

Update:

12/10/2023

Bibliography

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TU2 INTER AND TRANSDISCIPLINARITY

2023-24 / S3

Director:

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Training:

Master

ECTS:

3

Volume horaire (h) :

15 CM + 12 TD

Teaching language:

English

Update:

12/10/2023

Objectives

To understand how interdisciplinary or transdisciplinary approaches can be implemented to analyze the processes and changes experienced by water.

Content

This course will first address the theoretical knowledge on interdisciplinary and transdisciplinary, different conceptualizations and models of reality (Cartesian model, systemic approach ...). This course will also emphasize epistemological positions at the interface between several disciplines such as political ecology, ecotoxicology or ecohydrology.
Students will conduct semi-structured interviews with leaders of inter or transdisciplinary projects. The aim will be to understand why, when and how actors implement these types of approaches and the advantages, difficulties and even limitations that they have faced. Case studies of the H2O'Lyon consortium such as the Field Observatory in Urban Hydrology (OTHU), the Observatory of Human and Environments in the Rhone Valley (OHM Vallée du Rhône) or the Long-Term Ecosystem Research on the Rhone watershed (ZABR) will be studied.

Methods / Teaching activities

Lectures, seminars, semi-structured interview, serious games, participatory methods.

Evaluation modalities

Four notes on the interview (grid, recording, retranscription, analysis) (30%); a group work/essay (40%); an individual essay (30%).

Prerequisites

TU7

Competences

tbc

Teachers / Speakers

E. Comby, O. Navratil (Univ. Lyon 2); H. Piégay, G. Pinay (CNRS, ENS-Lyon); S. Charles (Univ. Lyon 1); O. Hamant (INRAE-Lyon); E. Caillouet (Eau'Dyssée); S. Barraud (INSA-Lyon); S. Pujalon (CNRS, Univ. Lyon 1).

TU3 DISCIPLINARY BASIS

2023-24 / S3

Director:

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Training:

Master

ECTS:

3

Volume horaire (h) :

15 CM + 12 TD

Teaching language:

English

Update:

12/10/2023

Bibliography

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TU3 DISCIPLINARY BASIS

2023-24 / S3

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Training:

Master

ECTS:

6

Volume horaire (h) :

27 CM + 27 TD

Teaching language:

English

Update:

12/10/2023

Objectives

To provide a common base of fundamental knowledge enabling all students from different disciplines to build a common culture. It will ensure mutual understanding and promote interdisciplinary dialogue.

Content

This course is organised in four modules. Each module will address the key concepts of each disciplinary fields and the vocabulary elements to be mastered:
Module 1: sociology, economics, water and environmental law. It will focus on the sustainable and adaptive management of common resources such as river basins.
Module 2: hydrology, hydraulics and fluvial geomorphology. It will cover fundamentals (water cycle and stakes; river morphology, adjustments; natural and anthropic systems, hydraulic modelling) with a specific focus on the interactions between water, river and cities in the context of global change.
Module 3: biology, aquatic and terrestrial ecology. It will cover ecosystem functioning, terrestrial-aquatic coupling and global biodiversity.
Module 4: water chemistry and ecotoxicology. It will present the main principle of water chemistry, ecotoxicology and microbiology, including sampling methods, indicators, quality and risk assessments and spatio-temporal patterns.
During practicals students from different disciplines will work in small groups to formulate a common question or hypothesis based on the analysis of the state of art and of art works.

Methods / Teaching activities

Lectures, group work, literature analysis, analysis of art works.

Evaluation modalities

A final exam (an opinion paper based on individual and group work).

Prerequisites

TU7

Competences

tbc

Teachers / Speakers

Module 1: E. Comby, P. Polomé (Univ. Lyon 2); P. Billet, V. Chiu (Univ. Lyon 3)
Module 2: O. Navratil (Univ. Lyon 2); H. Piégay (CNRS, ENS-Lyon); G. Lipeme Kouyi (INSA-Lyon)
Module 3: B. Wissel, B. Kaufmann (Univ. Lyon 1); M. Alp (INRAE-Lyon)
Module 4: A. Richaume (Univ. Lyon 1); A. Dabrin (INRAE-Lyon); B. Clement (ENTPE)

Director:
Oldrich Navratil

Training:
Master

ECTS:
6

Volume horaire (h) :
27 CM + 27 TD

Teaching language:
English

Update:
12/10/2023

— Bibliography

(1) **1.** Gramsci A, 1931. The mouse and the mountain (a tale about determination). **2.** Ostrom E, 1990. Governing the Commons, Cambridge University Press. **3.** Pahl-Wostl C, 2007. Transitions towards Adaptive Management of Water Facing Climate and Global Change. Water Resources Management.
(2) **1.** Bonneau J et al. 2021. Field validation of a physically-based model for bioretention systems. Journal of Cleaner Production. **2.** Chin A, Gregory K, 2009. From research to application: Management implications from studies of urban river channel adjustment. Geography Compass, Wiley Online Library. **3.** Chin A, 2006. Urban transformation of river landscapes in a global context. Geomorphology. **4.** Hexiang Y, Vosswinkel N et al. 2020. Numerical investigation of particles' transport, deposition and resuspension under unsteady conditions in constructed stormwater ponds. Environmental Sciences Europe. **5.** Maté Marín A, Rivière N, Lipeme Kouyi G, 2018. DSM-flux: A new technology for reliable Combined Sewer Overflow discharge monitoring with low uncertainties. Journal of Environmental Management. **6.** Momplot A et al., 2017. Typology of the flow structures in dividing open channel flows. Journal of Hydraulic Research. **7.** Navratil O et al. 2013. Hydrogeomorphic adjustments of stream channels disturbed by urban runoff (Yzeron River basin, France). Journal of Hydrology. **8.** MOOC "Des rivières et des hommes". **9.** MOODLE "Introduction à l'hydrologie continentale".
3) **1.** Baxter CV et al. 2005. Tangled webs: reciprocal flows of invertebrate prey link streams and riparian zones. Freshwater biology. **2.** Muehlbauer JD et al. 2019. Aquatic–terrestrial linkages provide novel opportunities for freshwater ecologists to engage stakeholders and inform riparian management. Freshwater Science.
(4) **1.** Forbes VE et al., 1997. Ecotoxicologie - Théorie et applications, INRA, Collection Du labo au terrain. **2.** Huisman J et al. 2018. Cyanobacterial blooms, Nature reviews Microbiology. **3.** Ramade F, 2007. Introduction à l'écotoxicologie (Ed. Lavoisier).

TU4 CROSS-DISCIPLINARY ISSUES

2023-24 / S3

Director:

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Training:

Master

ECTS:

3

Volume horaire (h) :

15 CM + 12 TD

Teaching language:

English

Update:

12/10/2023

— Objectives

To be able to think about and to understand cross-disciplinary real-world issues.

— Content

In this course, students will organize or will be involved in the organization of three events on cross-disciplinary real-world issues that will be addressed to a different audience. The three events will concern a scientific workshop with PhD students, a seminar (for practictioners and scientists) and a public event and will focus on one or several of these topics:

- Challenges for biodiversity and socio-hydro systems: risks, representation of the nature, legal dimension... (workshop)
- Managing water related issues, notably in urban areas (link with TU5) (seminar)
- Actions, tools and incentives in the water sector: new technologies, political incentives, European Directives, participative approaches…) (public event)

In addition to the scientific knowledge, the master students will learn how to:

- Prepare an event (program, presenters, communication, supporting material, etc.),
- Invite and manage the speakers or participants,
- Manage the events (open to the public, chair, lead the discussion, …)
- Communicate on an event (before and after)
- Write a synthesis

For each event, students will write a short scientific synthesis. After the third seminar, students will generate a report describing what they learned from this experience and the water challenges presented during the seminars. course is organized into three modules.

— Methods / Teaching activities

Lectures, exhibition visits, meetings with experts in communication, group work.

— Evaluation modalities

Short documents on the preparation of the events, evaluation on the supporting material produced and oral performance (group, 70%), and an individual final synthesis (written, 30%).

— Prerequisites

TU1, TU3, TU7

— Competences

tbc

— Teachers / Speakers

F. Cherqui (INSA-Lyon); C.-L. Meyer (H2O'Lyon); E. Brelot/A. Clemens (GRAIE, tbc); communication service (tbc)

TU3 DISCIPLINARY BASIS

2023-24 / S3

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Training:

Master

ECTS:

3

Volume horaire (h) :

15 CM + 12 TD

Teaching language:

English

Update:

12/10/2023

Bibliography

Belmeziti A., Cherqui F., Tourne A., Granger D., Werey C., Le Gauffre P., Chocat B. (2015) Transitioning to sustainable urban water management systems: how to define expected service functions?, Civil Engineering and Environmental Systems, 32(4), 316-334.

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Hilbert, M. (2020). Digital technology and social change: the digital transformation of society from a historical perspective. Dialogues in Clinical Neuroscience, 22, 189–194.

Howe C. (2012) Communicating across disciplinary divides - are we bridging the gap?, In Water Sensitive Cities, Howe, C. & Mitchell, C. (Eds.), IWA Publishing, 97-108.

Larsen, T. A. and Gujer, W. (1997) The concept of sustainable urban water management. Water Science & Technology, 1997, 35(9), 3-10.

TU5 SUPERVISED PROJECT

2023-24 / S3

Director:

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Training:

Master

ECTS:

3

Volume horaire (h) :

27 TP

Teaching language:

English

Update:

12/10/2023

Objectives

To start preparing the collective work for the final research project that students will carry out during the final semester (semester 4).

Content

In this course, students from different disciplines will work in small groups (clusters) and will start to define their research project. The latter will be built in a collaborative way with the academic and external partners involved and will be framed to include a broad research problem on the topic of water and hydrosystems in line with social questions/issues.
Students will learn how to start framing their final training work: to define the research topic; to design research questions; to lead preliminary discussions with the external partners; to carry out collaborative work and task sharing. Students will also visit the different study areas and will be introduced to project management, such as interpreting the requirements and expectations of the external partners; understanding how to address partners' requests; dealing with specific action plans and time scheduling; and team building.

Methods / Teaching activities

Seminars, field visits, meetings with practitioners, group work.

Evaluation modalities

Oral presentation (50%), final document with literature review, methodology and project specifications (50%).

Prerequisites

NA

Competences

tbc

Teachers / Speakers

G. Lipeme-Kouyi (INSA-Lyon); C.-L. Meyer (H2O'Lyon); B. Belletti (H2O'Lyon, CNRS-EVS); students' supervisors

H2O'Lyon
Université de Lyon

TU5 SUPERVISED PROJECT

2023-24 / S3

Director:

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Training:

Master

ECTS:

3

Volume horaire (h) :

27 TP

Teaching language:

English

Update:

12/10/2023

— Bibliography

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TU6 TECHNICS AND METHODS

2023-24 / S3

Director:

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Training:

Master

ECTS:

6

Volume horaire (h):

27 CM + 27 TD

Teaching language:

English

Update:

12/10/2023

Objectives

To allow students to acquire the technical and methodological tools and skills to the scientific assessment of complex issues on the topic of water and hydrosystems.

Content

In this course, students will acquire a common base of knowledge, corresponding to several thematic fields (social sciences, hydrology/hydraulics/geomorphology, chemistry/ecotoxicology, ecology, biochemistry, Global Information System) allowing them to define the tools which are specific to each discipline and the associated research approach. In particular, it is planned to establish technical sheets on the different methods in order to build a portfolio.
In a second phase, students will learn how to develop an inter/transdisciplinary approach to deal with a real issue related to societal issues. The students will be able to design a methodological framework (material and methods) in an interdisciplinary context (i.e. identify the necessary skills, the needs, the data to be collected, the experimental plan) to answer the problem. This work will be done as a supervised project in interactions with teachers and tutors of student internship.

Methods / Teaching activities

Lectures, field visits, lab and computer work, group work.

Evaluation modalities

Continuous assessment (50%), final exam (50%).

Prerequisites

TU1, TU2, TU7, basic knowledge in statistics and GIS.

Competences

tbc

Teachers / Speakers

A.-K. Bittebiere, S. Charles, C. Lopes, S. Dolédec, F. Colas, J. Pansu (Univ. Lyon 1); J. Piffady, L. Valette (INRAE-Lyon); J.L. Bertrand-Krajewski, D. Tedoldi (INSA-LYON); M. Cottet (CNRS, ENS-Lyon).

TU6 TECHNICS AND METHODS

2023-24 / S3

Director:

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Training:

Master

ECTS:

6

Volume horaire (h):

27 CM + 27 TD

Teaching language:

English

Update:

12/10/2023

Bibliography

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TU7 COMMUNICATION AND APPLICATION

2023 /24 / S3

Director:

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Training:

Master

ECTS:

6

Volume horaire (h) :

30 CM + 27 TD

Teaching language:

English

Update:

12/10/2023

— Objectives

To provide knowledge and communication elements to ease the interactions and collaboration with the socio-economic partners.

— Content

In this course, students will specifically learn:

- Why (importance of disseminating information and scientific knowledge; collaboration and co-construction with stakeholders) and how (the tools, the modalities, etc.) to communicate with different audiences/publics
- How to adapt the communication according to the audience (water practitioners and managers, academics, public, etc.)
- What are the most appropriate means of communication, in different contexts and with different public (flyers, webinars/seminars, round table, scientific presentation, etc.).

This course will be also framed in collaboration with the other TUs (e.g. results dissemination).

— Methods / Teaching activities

Lectures, seminars, computer work, group work.

— Evaluation modalities

Continuous assessment (40%), final exam (written, 60%).

— Prerequisites

NA

— Competences

tbc

— Teachers / Speakers

A. Vernay, S. Charles, (Univ. Lyon 1); H. Piégay (CNRS, ENS-Lyon); C.L. Meyer (H2O'Lyon); practitioners (Agence de l'Eau, Marie du 3ème, ANEB, …; tbc)

TU7 COMMUNICATION AND APPLICATION

2023 /24 / S3

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Training:

Master

ECTS:

6

Volume horaire (h) :

30 CM + 27 TD

Teaching language:

English

Update:

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— Bibliography

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