UCLouvain	**lbres2204a** *2020*	Integrated water management of water resources

Due to the COVID-19 crisis, the information below is subject to change, in particular that concerning the teaching mode (presential, distance or in a comodal or hybrid format).

4 credits	22.5 h + 22.5 h	Q1

Teacher(s)	Jonard François ;Vanclooster Marnik ;
Language :	French
Place of the course	Louvain-la-Neuve
Main themes	The main objective of the course is to train students in the understanding of the challenges and the use of advanced methodologies for integrated water resources management. The topics that are covered are : - Concepts and challenges of integrated water resources management at different scales (local scale, watershed, country, region, international river basin, global). - Strategic, political and institutional aspects of integrated management of water resources. Introduction in current water policies (eg water policy for sustainable development). - Analytical tools for water management. Modelling of water resources systems (watersheds, reservoirs, perimeter, groundwater body) including technical, economic and social aspects. Analysis,planning, optimization and evaluation of water systems.
Aims	a. Contribution de l'activité au référentiel AA (AA du programme) M2.2 ; M2.3 ; M2.4 ; M2.5 b. Formulation spécifique pour cette activité des AA du programme (maximum 10) After the course, students should be able: - to explain the concept of integrated water resources management (IWRM); - to explain the political, institutional , legal and policy issues associated with integrated water resources management; - to develop policies, strategies and programs for sustainable development of water resources; - to illustrate the international cooperation programs in the field of IWRM in international river basins (eg the Mekong, the Nile ...); - to model a hydro- system, while considering the random nature of the flow ; - to apply optimization methods (dynamic programming, Lagrangian multipliers, linear programming, ...) in simple IWRM planning problems; - to compare the performance of a hydro- system with multiple criteria and objectives formulated by different actors; - to develop a methodology to implement policies, strategies and IWRM programs. - - - - *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".*
Evaluation methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** Theory: Oral examination with written preparation. Exercices: An assignment is transmitted to the students before the opening of the examination session. The student prepares a reply to the question and defend in an oral examintion. This exercice is evaluated by the assistant of the course.
Teaching methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** Theoretical course : Lectures in audience. Supported by video capsules Support by online exercises (Moodle, Python Notebooks) Practical work: Exercises in the computer room.
Content	Part I: Issues, Strategic, Policy and Institutional Aspects State of freshwater resources at the global and regional scales Status of current uses and future needs for freshwater at the global and regional levels State of water infrastructure and investment needs

	Issues and challenges of the 21st century
	Principles of Integrated Water Resources Management (IWRM)
	Institutional, political and legal framework for water management
	Elaboration of strategies and programmes for the management and development of water resources
	International cooperation for water management. Examples of cooperation for water resources management: Mekong River / Nile River
	Part II: Modelling, Management and Optimization Tools
	Aspects of Hydrosystem Modelling
	Hydroinformatics and management. Contributions of remote sensing.
	Programming, planning and optimization methods. Lagrangian multipliers. Linear programming. Dynamic programming.
	Stochastic aspects. Uncertainty and sensitivity analysis. Water risk analysis.
	Performance analysis. Multi-criteria and integrated water resources analysis.
Inline resources	Moodle Cop of the presentations Video capsules Exercises (Python Notebooks) Assignments for the practical work Link to reference work (https://link.springer.com/book/10.1007/978-3-319-44234-1)
Bibliography	D. Loucks and E. Van Beek: Water Resources System Planning and Management: An introduction to methods, models and applications. UNESCO, 2005.
Other infos	This course can be given in English.
Faculty or entity in charge	AGRO

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Agricultural Bioengineering	BIRA2M	4		🔍
Master [120] in Forests and Natural Areas Engineering	BIRF2M	4		🔍
Master [120] in Environmental Bioengineering	BIRE2M	4		🔍