UCLouvain

lgciv2055

2023

Analysis and mitigation of floods

4.00 credits	20.0 h + 15.0 h	Q1

Teacher(s)	Soares Frazao Sandra ;
Language :	English > French-friendly
Place of the course	Louvain-la-Neuve
Prerequisites	Basic knowledge of probability and statistics, as taught in LFSAB1105, as well as some prior knowledge in hydrology (but not mandatory, as the essential elements are recalled)
Main themes	• Determination of design floods • Management and operation of reservoirs and floodplains • Simplified flood propagation modelling • Introduction to the problematics of droughts
Learning outcomes	**At the end of this learning unit, the student is able to :** 1 Contribution to the acquisition and evaluation of the following learning outcomes of the programme in civil engineering: AA1.1, AA1.2, AA1.3, AA2.1, AA2.2, AA2.3, AA2.4, AA2.5, AA3.1, AA3.3, AA5.2, AA5.3, AA5.5, AA5.6, AA6.2. More specifically, at the end of the course, the student will be able to: • Determine the extreme discharges for the design of spilling systems and flood mitigation plans; • Design flood retention reservoirs; • Model the propagation of floods in a simplified way; • Determine the characteristics of drought events Transversal learning outcomes: • Links with events occurring in the world and critical assessment of those; • Water resource management; • Link technical and social aspects of flood mitigation planning
Evaluation methods	The evaluation takes place in two parts: • Continuous evaluation (60%) through regular assignments on the different topics of the course. Each assignment leads to a report or a presentation that is discussed with the professor during the exam session. • An oral examination (40%) about the theoretical concepts taught in the course.
Teaching methods	Lectures for the theory and practical applications of the course topics on real cases through homeworks or projects. The cours addresses questions related to sustainable development through the following activities: • Co-construction of a wiki on nature-based solutions (NBS) based on litterature research and on the discussing during the lectures • Evaluation of the return period of recent severe flood events and analysis of the frequency of occurrence of such events
Content	In close connection with SDG 13 "Climate action", the course deals with the origin and aggravating factors of floods and inundations, the quantification of the return period of these extreme events, their consequences on the management of reservoirs and territories as well as how territorial developments can contribute to risk reduction. These aspects are addressed as follows: 1. The question of floods and inundations • Origin of floods • Natural and man-induced causes 2. Pre-determination of flood discharges • Empirical methods (historical methods, or based on the watershed dimensions) • Statistical methods (extreme value distributions) and determination of teh return period • Rainfall-discharge relation for extreme events 3. Flood control • Retention reservoirs and flood attenuation • Reservoir exploitation: flow mass curve, stochastical simulation (Fiering)

	• Reservoir sedimentation • Flood control for hydropower reservoirs 4. Flood protection measures • At teh level of the watershed • In the floodplains • Use of nature-based solution (NBS) to reduce the impact of floods in vulnerable territories 5. Flood propagation • Hydrological methods (Muskingum) • Methods of cells
Inline resources	Moodle site for the course, with lecture slides and notes, and other useful documents.
Bibliography	
Other infos	The use of generative Artificial Intelligence (AI) tools is tolerated as long as they are used responsibly and in accordance with academic and scientific integrity practices. In particular, the student is required to systematically indicate all parties having used AI, e.g. in a footnote specifying whether AI was used to search for information, to draft the text or to correct it. Furthermore, sources of information must be systematically cited while respecting bibliographic referencing standards. The student also remains responsible for the content of his or her production, regardless of the sources used.
Faculty or entity in charge	GC

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Civil Engineering	GCE2M	4		🔍