UCLouvain

lgciv2051

2025

Applied hydraulics : open-channel flows

The version you're consulting is not final. This course description may change. The final version will be published on 1st June.

5.00 credits	30.0 h + 30.0 h	Q1

Teacher(s)	Soares Frazao Sandra ;
Language :	English > French-friendly
Place of the course	Louvain-la-Neuve
Prerequisites	Fundamental hydraulics or fluid mechanics, as taught in LGCIV1051
Main themes	- Fundamentals in Hydrology - Open-channel flows (steady flows)
Learning outcomes	**At the end of this learning unit, the student is able to :** **Contribution of the course to the program objectives (N°)** AA1.1, AA1.2, AA1.3, AA2.1, AA5.2, AA5.3 **Specific learning outcomes of the course** 1 • Design of irrigation channels • Design of urban sewers • Calculation of steady flow water profiles in channels • Description and calculation of the effects of local changes in the channel geometry on the flow (narrowing, widening, change in bed slope, presence of bridge piers) Transversal learnning outcomes of the course : • Create and use and Excel sheet to solve in a simple and efficient way problems in hydraulic engineering • Basic use of a software for river flow calculations • Summarize the acquired knowledge in order to present on the blackboard a clear and concise answer to a given question • Initiate a general questioning on the use of water resources
Evaluation methods	The final mark for the course comprises the continuous evaluation (40%) and the oral examination during the exam session (60%). Continuous evaluation: • Two homeworks evaluated based on a report. The mark for the homework is only considered if the other activities are successfully passed. • One written test about open-channel flow calculations. In case of unjustified absence for one of these activities, or if a homework is not delivered, the student will be considered as absent for teh evaluation, and will obtain a 0/20 mark for the entire course. The student will have to complete these activities for the second exam session (August-September) to obtain the final mark according to the above mentioned weighting. Oral exam: • Preparation of answers on the blackboard, without the lecture notes • Three questions covering the whole course
Teaching methods	Lectures, practical exercises, homeworks and laboratory, all in close link with each other Numerous examples of applications and real cases where the methods developed in the course were applied Use of softwares (Q-GIS, SWMM, HEC-RAS) and creation of Excel calculation sheets
Content	The course addresses technical content related to hydrology and open-channel flows, while making the link with the direct and indirect environmental impacts related to water management as regards floods and inundations. • Introduction : purpose of open-channel hydraulics • Hydrology: rain, water cycle, measurement and analysis of discharges, rainfall-discharge relationships (unit hydrograph, rational method, Hauff-Vicari)

	• Steady open-channel flows: channels, sewers, and rivers. Steady uniform flow: Chezy and Manning equations, optimal trapezoidal section, compound and heterogeneous channels, normal depth calculation in channels and sewers. Gradually varied flows: specific energy, critical depth, critical slope, flow profiles (theory and practical calculations). Flow in natural rivers: pseudo-uniform flow. Rapidly varied flow: hydraulic jump, drawn jump. Flow in non-prismatic geometry: flow between a gate and a reservoir, change in bed slope, change in channel width, presence of bridge piers, Venturi flumes, bottom sill, broad crested weir. Through these themes, the following SDGs are addressed and discussed: SDG 6: Clean water and sanitation SDG 11: Sustainable Cities and Communities SDG 13: Climate action
Inline resources	Moodle web site for the course MOOC edX « Hydraulique fluviale 1 : écoulements à surface libre » Podcasts on Youtube
Bibliography	Chow, "Open-channel hydraulics" Lencastre, "Hydraulique générale"
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	5		🔍
Master [120] in Architecture and Engineering	ARCH2M	5		🔍