lgciv2051

2021

Applied hydraulics : open-channel flows

5.00 credits	30.0 h + 30.0 h	Q1

Teacher(s)	Soares Frazao Sandra ;
Language :	English
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) • Weirs, and applications to spillways
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, AA2.2, AA2.4, AA4.1, AA4.4, AA5.2, AA5.3 **Specific learning outcomes of the course** 1 • Determine the design discharge for several types of civil engineering works • Design irrigation channels • Design urban sewers • Calculate steady flow profiles in channels • Describe and calculate the effects of local changes in the channel geometry on the flow (narrowing, widening, change in bed slope, presence of bridge piers) • Design of spillways (normalized Creager profile) Transversal learning outcomes of the course : • Create and use and Excel sheet to solve in a simple and efficient way problems in hydraulic engineering • 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	Exercises (1/3 of the final mark): homeworks (hydrology, spillways) and written test consisting in steady flow water profiles calculations using the Excel sheet. Oral exam (2/3 of teh final mark) on the theoretical aspects, with 3 questions covering the entire course.
Teaching methods	Lectures, practical exercises and laboratory, all in close link with each other. Depending on the number of registered students, courses will be given in the class or online. Numerous examples of applications and real cases where the methods developed in the course were applied Use of didactic softwares, videos and a MOOC course, creation of Excel calculation sheets
Content	• 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. • Weirs and spillways: Thin crested weir, normalized Creager profile, free or drawn outflow, spillways
Inline resources	Moodle web site for the course MOOC edX « Hydraulique fluviale 1 : écoulements à surface libre » Videos of the different lessons: LGCIV2051 - YouTube
Bibliography	Chow, "Open-channel hydraulics". Lencastre, "Hydraulique générale".

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		🔍