UCLouvain

lgciv2053

2021

Fluvial hydraulics

4.00 credits	20.0 h + 15.0 h	Q2

Teacher(s)	Soares Frazao Sandra ;
Language :	French
Place of the course	Louvain-la-Neuve
Prerequisites	Good prior knowledge of basic hydraulics or fluid mechanics, and good knowledge of open-channel flows (uniform flow, critical depth, flow profiles) as taught for example in LGCIV2051
Main themes	• Characterization of the fluvial environment • Sedimentology: erosion criteria and sediment transport • Fluvial morphology
Learning outcomes	**At the end of this learning unit, the student is able to :** 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, AA3.1, AA3.3, AA5.2, AA5.3, AA5.4, AA5.5, AA5.6, AA6.1, AA6.2, AA6.3 More specifically, at the end of the course, the student will be able to: 1 • Calculate a flow in a natural river taking into account the sediment roughness and the influence of bedforms • Evaluate the sediment transport in a river • Design river training devices to improve the river morphological stability Transversal learning outcomes: links are made in the course to physical geography, geopolitics and history.
Evaluation methods	Continuous evaluation through homeworks and projects and oral exam for the theoretical part.
Teaching methods	Lectures about the theoretical concepts, practical exercises, laboratory applications and small projects. Numerous examples are given, from the litterature or based on the teacher's experience.
Content	1. Introduction : definition of fluvial hydraulics, types of rivers 2. Sedimentology · Definitions, general river morphology, bedforms • Modes of sediment transport • Non-dimensional variables of sedimentology - Velocity distribution, mean velocity, shear velocity - Dimensional analyssis and characteristic numbers • Threshold for erosion of sediment bed - Velocity criterion and river equilibrium profile - Shear stress criterion : Shields and van Rijn diagrams · Bed roughness in natural rivers, stage-discharge relation : Einstein's analysis • Bed-load sediment transport - Transport principles of du Boys - Analysis of Meyer-Peter and Müller - Other current approaches (Einstein, Bagnold, etc.) • Suspended load sediment transport - Transport équations - Equilibrium concentration profile (theory of Vanoni'Rouse) - Suspended load (Einstein's integration) 3. Morphological evolution of rivers • Sedimentologic equilibrium - Practical formulae : regime theories - Bank stability, stable cross-section shape

	• Morphological response to river training works • Helical flow in meanders 4. River training works • Principles : Fargue's laws and rules • Local works : surface panels, bandalling, bottom panels, bottom sills, bank protection • River works : banks, longitudinal dikes, groynes, sills • Channelization 5. Examples
Inline resources	Moodle web site with the lecture slides, some lecture notes, videos and useful information about the course. MOOC (in French) on the edX platform: « Hydraulique fluviale 2 : sédiments et morphologie fluviale »
Bibliography	Notes de cours Jansen et al., "Principles of river engineering" Chang, 'Fluvial processes in river engineering'
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		🔍