UCLouvain

lgciv2054

2021

Numerical simulation of transient flows

4.00 credits	20.0 h + 15.0 h	Q2

Teacher(s)	Soares Frazao Sandra ;
Language :	English
Place of the course	Louvain-la-Neuve
Prerequisites	A good knowledge of basic hydraulics or fluid mechanics and open-channel flows (as taught e.g. in LGCIV1051 and LGCIV2051) is an asset but is not mandatory.
Main themes	Mathematical models and numerical resolution of transient flows in contexts such as: • Water distribution networks • Open-channel flows • Natural rivers with morphological evolution
Learning outcomes	**At the end of this learning unit, the student is able to :** 1 **Contribution of the course to the program objectives (N°)** AA1.1, AA1.2, AA2.1, AA2.2, AA2.3, AA2.4, AA2.5, AA3.1, AA3.2, AA3.3, AA4.2, AA4.4, AA5.2, AA5.3, AA5.6 **Specific learning outcomes of the course** More precisely, at the end of the course, the student will be able to : • Calculate water hammers in a pipe network • Calculate transient flows in rivers • Evaluate the consequent morphological evolution
Evaluation methods	Continuous evaluation through homeworks and projects. Oral exam for the theoretical part.
Teaching methods	Lectures for the theoretical concepts. Practical applications through homewroks and projects.
Content	1. Transient flows in pressurized pipe networks : • Water hammer : rigid column theory • Pressure waves 2. Free-surface transient flows • One-dimensional flows - Saint-venant equations, solutions by the method of characteristics - Wave speed analysis - Positive and negative waves • Two-dimensional flow equations • Numerical methods - Finite-differences : Harten, Mac Cormack - Finite-volume and shock-capturing methods - Application : dam-break flow 3. Morphological evolution in rivers • Numerical models (finite-differences, finite-volumes) • Non-equilibrium sediment transport • Applications : dam-break flows over mobile beds
Inline resources	Moodle web site with the lecture slides, some lecture notes, and other useful information.
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		🔍