UCLouvain

lgciv2013

2026

Hydraulic structures

5.00 credits	30.0 h + 15.0 h	Q2

Teacher(s)	Bousmar Didier ;Soares Frazao Sandra ;
Language :	English > French-friendly
Place of the course	Louvain-la-Neuve
Prerequisites	Basic knowledge of open-channel flows and structural stability, as taught in the courses LGCIV1022, LGCIV1023, LGCIV1051, LGCIV2051, LGCIV1072
Main themes	The course “Hydraulic structures” covers a general introduction to the design and use of these structures. It presents the main concepts and the main criteria leading to different technical options during design. The sizing hypotheses are introduced. Details of calculation method are not always covered, but reference is made to related courses.
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, AA1.3 • AA2.1 • AA3.1, AA3.3 • AA4.1, AA4.2, AA4.4 • AA5.2, AA5.3, AA5.4, AA5.5, AA5.6 • AA6.1, AA6.4 More specifically, at the end of the course, the student will be able to: • sketch a fluvial/hydraulic development (local or global) and choose the most appropriate technical solution for the final design, considering building process and environmental constraints.
Evaluation methods	There is no exam for this course. The continuous evaluation is based on: • An evalation of the participation to the classes (mandatory presence) • A group work on a specific design case related to the course : written report and oral presentation In case of insufficient participation of a group member, the final mark could differ from that attributed to the group.
Teaching methods	Ex-cathedra presentations, combined with field visit of relevant civil works, completed or in progress; design exercises, and/or case study analysis. Flipped classes based on work prepared by students on themes proposed by teachers. In this work, in addition to the technical aspects linked to the theme addressed, students are invited to question the qualitative analysis of its direct and indirect environmental impacts.
Content	**1. Waterways** Introduction to fluvial transport, waterways classification. Waterways design: free-flowing river, canalized river, artificial canal, lock approaches. Waterways dimensions: ship manoeuvrability, sailing resistance, Schijf approach, standard sections and over-widths, norms and best practice. Bank protection: vertical walls, permeable and impervious banks, naturalized banks **2. Locks** Definitions, vocabulary, implantation. Filling/emptying systems: through the head, longitudinal distribution, equi-distribution, valves, valve opening schedule, water saving basin. Chamber design: loads, typical cross-sections, seepage cut-off. Equipments, gates (mitre, sector, radial, flap, lifting, rolling). High drop crossing: ship lifts and inclined planes **3. Mobile weir** Weir functions, general design. Main elements: floor, piles, abutment, seepage cut-off, auxiliary works. Fixed parts: loads, design of piles and floor, energy dissipation and protection against scouring and internal erosion.

	obile parts: overflow and underflow, gates (lifting, radial, roller drum, sector, flap), old systems (stoplog dam, needle dam, wicket gates). **4. Large dams** Typology, application fields, loads, auxiliary works. Gravity dams: design, building process, buttress dams, roller-compacted concreted dams. Arch dams: design principle. Spillways
Inline resources	Available on Moodle
Bibliography	Slides, course summaries, reference texts, recommended reading as listed on Moodle
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		🔍