

Due to the COVID-19 crisis, the information below is subject to change, in particular that concerning the teaching mode (presential, distance or in a comodal or hybrid format).


5 credits	30.0 h + 30.0 h	Q1
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Teacher(s)	Soares Frazao Sandra ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	<ul style="list-style-type: none"> • Fundamentals in Hydrology • Open-channel flows (steady flows) • Weirs, and applications to spillways
Aims	<p>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</p> <p>Specific learning outcomes of the course</p> <ul style="list-style-type: none"> • 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) <p>Transversal learning outcomes of the course :</p> <ul style="list-style-type: none"> • Create and use an 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 <p>Initiate a general questioning on the use of water resources</p> <p>-----</p> <p><i>The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".</i></p>
Evaluation methods	<p>Due to the COVID-19 crisis, the information in this section is particularly likely to change.</p> <p>Exercises (40 % of the final mark): homeworks (hydrology, spillways) and written test consisting in steady flow water profiles calculations using the Excel sheet. The final mark for the exercises is conditioned by the success in the written test.</p> <p>Oral exam (60 %) on the theoretical aspects, with 3 questions covering the entire course.</p> <p>In case of severe failure of one part of the exam (mar < 7/20), the above-mentioned weights might be adapted.</p>
Teaching methods	<p>Due to the COVID-19 crisis, the information in this section is particularly likely to change.</p> <p>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.</p> <p>Numerous examples of applications and real cases where the methods developed in the course were applied</p> <p>Use of didactic softwares, videos and a MOOC course, creation of Excel calculation sheets</p>
Content	<ul style="list-style-type: none"> • 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 »
Bibliography	Chow, "Open-channel hydraulics". Lencastre, "Hydraulique générale".
Faculty or entity in charge	GC

Force majeure

Teaching methods	A series of podcast videos is available. These are complemented by online questions and answers using Teams.
Evaluation methods	An adapted exam will be proposed at the same time as the regular on site exam for students who have demonstrated prior to the exam the impossibility to present it on site. This impossibility consists of a certificate of quarantine or a "return certificate" from the Federal Public Service Foreign Affairs. The exam will cover exactly the same topics as the regular exam, and will be conducted in written and oral forms compatible with the student's situation. Written exam: exercises to be submitted as a take-home exam with limited time. Oral exam: online discussion based on the lecture slides, without preparation time.
Other infos	Additional information will be provided on the Moodle site of the course.

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Architecture and Engineering	ARCH2M	5		
Master [120] in Civil Engineering	GCE2M	5		