

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).

4 credits	20.0 h + 15.0 h	Q2
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Teacher(s)	Soares Frazao Sandra ;
Language :	French
Place of the course	Louvain-la-Neuve
Main themes	<ul style="list-style-type: none"> • Characterization of the fluvial environment • Sedimentology: erosion criteria and sediment transport • Fluvial morphology
Aims	<p>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</p> <p>More specifically, at the end of the course, the student will be able to:</p> <p>1</p> <ul style="list-style-type: none"> • 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 <p>Transversal learning outcomes: links are made in the course to physical geography, geopolitics and history.</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>Continuous evaluation through homeworks and projects.</p> <p>Oral exam for the theoretical part. In case of failure of the oral exam, the final mark will reflect this failure.</p>
Teaching methods	<p>Due to the COVID-19 crisis, the information in this section is particularly likely to change.</p> <p>Lectures about the theoretical concepts, practical exercises, laboratory applications and small projects.</p> <p>Numerous examples are given, from the literature or based on the teacher's experience.</p>
Content	<ol style="list-style-type: none"> 1. Introduction : definition of fluvial hydraulics, types of rivers 2. Sedimentology <ul style="list-style-type: none"> • Definitions, general river morphology, bedforms • Modes of sediment transport • Non-dimensional variables of sedimentology <ul style="list-style-type: none"> - Velocity distribution, mean velocity, shear velocity - Dimensional analysis and characteristic numbers • Threshold for erosion of sediment bed <ul style="list-style-type: none"> - 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 <ul style="list-style-type: none"> - Transport principles of du Boys - Analysis of Meyer-Peter and Müller - Other current approaches (Einstein, Bagnold, etc.) • Suspended load sediment transport <ul style="list-style-type: none"> - Transport equations - Equilibrium concentration profile (theory of Vanoni'Rouse) - Suspended load (Einstein's integration)

	<p>3. Morphological evolution of rivers</p> <ul style="list-style-type: none"> • Sedimentologic equilibrium <ul style="list-style-type: none"> - Practical formulae : regime theories - Bank stability, stable cross-section shape • Morphological response to river training works • Helical flow in meanders <p>4. River training works</p> <ul style="list-style-type: none"> • 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 <p>5. Examples</p>
<p>Inline resources</p>	<p>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 »</p>
<p>Bibliography</p>	<p>Notes de cours Jansen et al., "Principles of river engineering" Chang, 'Fluvial processes in river engineering'</p>
<p>Faculty or entity in charge</p>	<p>GC</p>

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Civil Engineering	GCE2M	4		