


4 credits

20.0 h + 15.0 h

Q1

|                             |  |
|-----------------------------|--|
| Teacher(s)                  | Soares Frazao Sandra ;   |
| Language :                  | English  |
| Place of the course         | Louvain-la-Neuve   |
| Main themes                 | Mathematical models and numerical resolution of transient flows in contexts such as: <ul style="list-style-type: none"> <li>• Water distribution networks</li> <li>• Open-channel flows</li> <li>• Natural rivers with morphological evolution</li> </ul>  |
| Aims                        | <p><b>Contribution of the course to the program objectives (N°)</b><br/>                     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</p> <p><b>Specific learning outcomes of the course</b></p> <p>1 More precisely, at the end of the course, the student will be able to :</p> <ul style="list-style-type: none"> <li>• Calculate water hammers in a pipe network</li> <li>• Calculate transient flows in rivers</li> <li>• Evaluate the consequent morphological evolution</li> </ul> <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          | Continuous evaluation through home works and projects, and oral examination  |
| Teaching methods            | Theoretical courses and practical exercises through small projects   |
| Content                     | 1. Transient flows in pressurized pipe networks : <ul style="list-style-type: none"> <li>• Water hammer : rigid column theory</li> <li>• Pressure waves</li> </ul> 2. Free-surface transient flows <ul style="list-style-type: none"> <li>• One-dimensional flows                             <ul style="list-style-type: none"> <li>- Saint-venant equations, solutions by the method of characteristics</li> <li>- Wave speed analysis</li> <li>- Positive and negative waves</li> </ul> </li> <li>• Two-dimensional flow equations</li> <li>• Numerical methods                             <ul style="list-style-type: none"> <li>- Finite-differences : Harten, Mac Cormack</li> <li>- Finite-volume and shock-capturing methods</li> <li>- Application : dam-break flow</li> </ul> </li> </ul> 3. Morphological evolution in rivers <ul style="list-style-type: none"> <li>• Numerical models (finite-differences, finite-volumes)</li> <li>• Non-equilibrium sediment transport</li> <li>• Applications : dam-break flows over mobile beds</li> </ul> |
| Inline resources            | Moodle web site with Powerpoint slides, partial lecture notes and other useful documents.  |
| Faculty or entity in charge | GC   |

| <b>Programmes containing this learning unit (UE)</b> |         |         |              |   |
|--|---------|---------|--------------|---|
| Program title  | Acronym | Credits | Prerequisite | Aims  |
| Master [120] in Civil Engineering                    | GCE2M   | 4       |              |  |