



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	22.5 h + 22.5 h	Q2
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Teacher(s)	Javaux Mathieu ;
Language :	French
Place of the course	Louvain-la-Neuve
Main themes	- Theory of open channel hydraulics - Classification of flow : uniform and non-uniform flow ; steady state and gradually varied flow - Properties of open channels : energy and momentum principles - Velocity profiles. Specific energy, specific force - Hydrometrology : Venturi, Parshall, gauging, - Uniform flow theory - Gradually varied flow theory. Classification of hydraulic axes. Integration methods - Rapidly varied flow : hydraulic jump, fall, weirs - Types of irrigation systems : gravity, pressure or drip irrigation - Theory of water flow in pipes - Pressure irrigation networks : pumps, pipes, sprinklers; design of a network - Irrigation and salinity.
Aims	<p>a. Contribution de l'activité au référentiel AA (AA du programme) M1.2 ; M2.2 ; M2.3 ; M2.4 ; M4.5 ; M6.5 ; M6.8</p> <p><u>Irrigation:</u> Upon completion of the course and practicals, the student will be able to :</p> <ul style="list-style-type: none"> <li>- Master the basic knowledge about the water requirements of plants</li> <li>- have the basic knowledge about water intake structures, conveyance, and regulation devices for irrigation water</li> <li>- estimate net irrigation water requirements and propose an irrigation schedule</li> </ul> <p>1</p> <ul style="list-style-type: none"> <li>- design an irrigation system under drip, pressure or gravity</li> <li>- Describe the principles underlying the different irrigation techniques</li> <li>- Design an irrigation management scheme and to evaluate its functioning</li> </ul> <p><u>Drainage :</u> At the end of the course and lab, the student will be able to:</p> <ul style="list-style-type: none"> <li>- Master the theoretical concepts underlying the flow of water into drains and design techniques of drainage;</li> <li>- Assess the value of drainage on the basis of technical, economic and environmental considerations;</li> <li>- Dimension a parallel drainage network using the relevant equations.;</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	<p><b>Due to the COVID-19 crisis, the information in this section is particularly likely to change.</b></p> <p>The students will be evaluated on the basis of 'continuous' evaluation.</p> <p>The final grade is composed of the weighted average of 6 grades:</p> <ul style="list-style-type: none"> <li>- Individual progress presentation of the group project (individual)</li> <li>- written report on Aquacrop (by group)</li> <li>- written report on Drainage exercise (by group)</li> <li>- written report on Sprinkler irrigation practical (by group)</li> <li>- written report on the irrigation project (by group)</li> <li>- Multiple choice on the MOOC (individual)</li> </ul>

Teaching methods	<p><b>Due to the COVID-19 crisis, the information in this section is particularly likely to change.</b></p> <ul style="list-style-type: none"> <li>- theory is based on e-learning. A MOOC 'technique d'irrigations' is available, which provides most of the theory through 6 modules. Questions on each module are discussed with the teacher in the course. Theory on drainage is taught in class.</li> <li>- Applied project performed by group. Workshops are regularly organized with the technicians and the professors to help progress. Every two weeks, joint sessions allow one student of each team to present orally its progress, to hear the work of other teams and get comments and suggestions (feedback) from all the teachers.</li> <li>- practicals on AQUACROP and drainage techniques</li> <li>- roleplay on irrigation water management</li> <li>- excursion : visit of irrigated sites in Belgium</li> </ul>
Content	<p>Six online modules allow students to learn the theoretical background on:</p> <ul style="list-style-type: none"> <li>- M1: why to irrigate and what are consequences of irrigation?</li> <li>- M2: soil-water-plant relations</li> <li>- M3: surface irrigation</li> <li>- M4: soil-water-plant relations</li> <li>- M5: micro-irrigation</li> <li>- M6: how to choose and evaluate irrigation systems?</li> </ul> <p>Theory on drainage will be taught in class : principles, types of drainage systems, design of drainage systems.</p> <p>Practicals will allow students to (1) use AQUACROP to estimate plant water needs, (2) design a drainage network, and (3) characterize uniformity under sprinkler irrigation.</p> <p>An applied project allows students to apply their knowledge on a real irrigation system and to learn how to combine sensors to estimate irrigation doses and timing. Students will have to program a datalogger which controls the water pump and the sensors and to install a real irrigation system in a field in order to maintain plants alive until the end of the quadrimester.</p>
Inline resources	Moodle
Bibliography	<p>Ouvrage de référence :</p> <p>« Traité d'irrigations », Tiercelin et al.</p> <p>Syllabus pour la partie drainage (sur Moodle)</p>
Other infos	This course can be given in English.
Faculty or entity in charge	AGRO

<b>Programmes containing this learning unit (UE)</b>				
Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Agricultural Bioengineering	BIRA2M	4		
Master [120] in Environmental Bioengineering	BIRE2M	4		
Master [120] in Agriculture and Bio-industries	SAIV2M	4		