

Faculty of Biological, Agronomic and Environmental Engineering

BRES2201 Irrigation, drainage and soil preservation

[37.5h+22.5h exercises] 5 credits

This course is taught in the 1st semester

Teacher(s): Charles Bielders, Mathieu Javaux
Language: French
Level: Second cycle

Aims

Part A : Irrigation (2 ECTS) and Drainage (1 ECTS)

Upon completion of the course and practicals, the student will be able to

- master the theory of flow in pipes;
- describe the principles that underlie the various irrigation techniques;
- be able to design an irrigation management scheme and to evaluate its functioning;
- master the theoretical concepts that underlie water flow towards subsurface drains and the design techniques for drainage networks;
- be able to evaluate the need for drainage on the basis of technical, economic and environmental considerations;
- be able to design a parallel drainage network on the basis of simple equations or numerical models.

Part B : Soil conservation (2 ECTS)

Upon completion of the course and practicals, the student will be able to :

- explain the main mechanisms involved in soil degradation by wind and water erosion;
- propose an experimental methodology for quantifying land degradation by water erosion at the scale of the plot and watershed;
- use a water erosion model to evaluate the erosion risk at plot or watershed scale;
- be able to explain the principles of soil conservation;
- suggest practices, technologies or land management schemes for reducing erosion at the field or watershed levels that are adapted to the socio-economic and technical environment of the land users.

Main themes

- 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; fertigation
- Functions of drainage
- Characteristics of a drainage network, placement and maintenance
- Design of a drainage network
- Wind and water erosion : physical processes and assessment
- Modelling water erosion
- Principles of soil conservation in temperate and tropical areas
- Soil conservation technologies : structural, agronomic, vegetal, and management

Content and teaching methods

Following a brief description of the various irrigation techniques, the course will focus on sprinkler irrigation : principles of water flow in pipes, components of irrigation networks (pumps, pipes, sprinklers, #), evaluation of irrigation water requirements, management of salinisation risk, fertigation. The design of an irrigation network will be addressed during the practicals. The functions, characteristics as well as the techniques for placement, dimensioning, and maintenance of irrigation networks will then be addressed. For this purpose, we will introduce the equations for dimensioning drainage networks under steady (Hooghoudt) and unsteady (Glover-Dumm, et Zeeuw et Hellinga) flow conditions. During the practicals, these equations will be used by the students for dimensioning a drainage network. If time permits, students will also be introduced to the use of a numerical model for this purpose. In the second part, land degradation by wind and water erosion will be addressed. For both forms of erosion, the physical processes and methods of assessment will be presented. The principles of water erosion modelling will then be introduced. A water erosion simulation model will be used during the practicals. Finally, the main principles of soil conservation will be presented, followed by a brief description of the main techniques and methods available for soil conservation.

Other information (prerequisite, evaluation (assessment methods), course materials recommended readings, ...)

Evaluation The students will be evaluated on the basis of their reports on the practicals as well as through a final exam. The final exam will be oral with a written preparation, and will include problem solving as well as comprehension questions.
Support Irrigation : Drainage : course notes
Erosion and soil conservation :

Other credits in programs

BIR23/7A	Troisième année du programme conduisant au grade de bio-ingénieur : Sciences agronomiques (Ressources en eau et en sol)	(5 credits)	Mandatory
BIR23/7E	Troisième année du programme conduisant au grade de bio-ingénieur : Sciences et technologie de l'environnement (Ressources en eau et en sol)	(5 credits)	Mandatory