

Course Unit	Hydraulic and Irrigation		Field of study	Rural Engineering	
Bachelor in	Agronomic Engineering		School	School of Agriculture	
Academic Year	2022/2023	Year of study	3	Level	1-3
Type	Semestral	Semester	2	ECTS credits	6.5
Code	9086-307-3204-00-22				
Workload (hours)	175,5	Contact hours	T 30	TP -	PL 30
			TC -	S -	E -
			OT 20	O -	

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

Name(s) of lecturer(s) António Castro Ribeiro, Nuno Miguel Santos da Conceicao

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:
Know the methodologies for computing crop and irrigation water requirements. Know the main irrigation and drainage systems.

Prerequisites

Before the course unit the learner is expected to be able to:
1. Solve and analyze practical fluid mechanics problems
2. Interpret topographic maps.

Course contents

Basic principles of fluid mechanics. Flow in pipes and closed conduits: fundamental equations; types of flow; head losses; Hydraulic machines. Pumping stations. Flow in open channels. Hydraulic measurements. Crop water requirements. Water balance and crop irrigation requirements; Irrigation methods: surface irrigation; sprinkler irrigation; microirrigation: system design, monitoring and management. Drainage: drainage requirements and system design.

Course contents (extended version)

1. Basic principles of fluid mechanics
2. Flow in pipes and closed conduits
3. Pumping stations to supply water to reservoirs and irrigation systems
4. Flow in open channels
5. Hydraulic measurements
6. Crop water requirements
 - Concepts
 - Evapotranspiration: measurement and estimation
 - Reference evapotranspiration: FAO-Penman-Monteith equation
 - Crop evapotranspiration. Crop coefficients
7. Soil water balance and irrigation requirements
 - Soil water: definitions and concepts; methodologies for soil water measurement
 - Soil water balance in the root zone.
 - Soil water balance and irrigation water requirements
8. Irrigation methods
 - Surface irrigation
 - Sprinkler irrigation
 - Microirrigation
9. Soil drainage
 - Drainage methods
 - System design

Recommended reading

1. Allen, R. G. , Pereira, L. S. , Raes, D. , Smith, M. , 1998. Crop evapotranspiration. Guidelines for computing crop water requirements. FAO Irrigation and Drainage Paper 56, Rome.
2. Cuenca, R. H. 1989. Open channel flow. In: Irrigation system Design, pp. 464-522, Prentice-Hall Inc.
3. Lencastre, A. 1983. Hidráulica geral. Hidroprojecto, Lisboa.
4. Keller, J. & Bliesner, R. D. 1990. Sprinkle and Trickle irrigation. Chapman & Hall, NewYork.
5. Pereira, L. S. 2004. Necessidades de água e métodos de rega. Europa-América, Lisboa.

Teaching and learning methods

Lectures: oral presentation. Lab sessions: resolution of problems on applied hydraulics and irrigation systems design. Field sessions: observation of irrigation systems; technical visits to surrounding farms and irrigation projects. Seminar: oral presentation of the irrigation system design.

Assessment methods

1. Alternative 1 - (Regular, Student Worker) (Final)
 - Practical Work - 30% (Minimum mark: 9, 5 (0-20))
 - Intermediate Written Test - 35%
 - Final Written Exam - 35% (Minimum mark: 9, 5 (0-20))
2. Alternative 2 - (Regular, Student Worker) (Final, Supplementary, Special)
 - Final Written Exam - 100% (The final exam includes the practical component)

Language of instruction

Portuguese, with additional English support for foreign students.

Electronic validation

António Castro Ribeiro, Nuno Miguel Santos da Conceicao	Arlindo Castro Ferreira Almeida	Albino António Bento	José Carlos Batista Couto Barbosa
19-12-2022	19-12-2022	20-12-2022	20-12-2022