

## 28945 - Irrigation and drainage systems

### Información del Plan Docente

Academic Year	2016/17
Academic center	201 - Escuela Politécnica Superior
Degree	437 - Degree in Rural and Agri-Food Engineering
ECTS	6.0
Course	4
Period	First semester
Subject Type	Compulsory
Module	---

### 1. Basic info

#### 1.1. Recommendations to take this course

#### 1.2. Activities and key dates for the course

### 2. Initiation

#### 2.1. Learning outcomes that define the subject

#### 2.2. Introduction

### 3. Context and competences

#### 3.1. Goals

#### 3.2. Context and meaning of the subject in the degree

#### 3.3. Competences

#### 3.4. Importance of learning outcomes

### 4. Evaluation

### 5. Activities and resources

#### 5.1. General methodological presentation

The learning process designed for this course is based on the following teaching modalities:

- *Theoretical sessions* . Face-to-face modality in which the contents of the proposed topics will be developed. It comprises the lectures (master classes) and debate.
- *Practical sessions focused on engineering problems solving* . Modality in which problems related to the contents of the subject will be solved, applying fundamental concepts from the theoretical sessions and using numerical methods.

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### 5.2.Learning activities

The program that the student is offered to help him/her achieve the expected results includes the following activities:

- *Theoretical sessions* : at the beginning of each session, the theoretical content that the teacher will cover in the class will be described. So as to develop reasoning abilities and in order to extend the study conditions, during these classes the students will also participate in the resolution of the issues raised and not explained by the teacher.
- *Problem-solving sessions* : a collection of exercises and problems will be provided for each of the topics covered in the syllabus. Some of those engineering problems will be solved in the classroom, leaving the rest for the autonomous work of the student. The proposed problems will address issues aimed at facilitating the learning of the theoretical foundations explained in the theoretical sessions and also different aspects representative of the engineering problems that occur during the development of a real irrigation, drainage or hydraulic project.

### 5.3.Program

Theoretical contents:

1. Introduction
2. Soil and water properties related to irrigation
3. Fundamental principles of irrigation
4. Surface irrigation
5. Spray irrigation
6. Localized irrigation
7. Drainage
8. Design of small scale hydraulic infrastructures

### 5.4.Planning and scheduling

Schedule of face-to-face sessions

2nd semester	Theoretical sessions		Problem-solving sessions		Modules / Topics
	F2F	AW	F2F	AW	
1st week	2	3	2	3	1-2
2nd week	2	3	2	3	2
3rd week	2	3	2	3	2
4th week	2	3	2	3	3
5th week	2	3	2	3	3
6th week	2	3	2	3	4-5
7th week	2	3	2	3	6

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8th week	2	3	2	3	6
9th week	2	3	2	3	6
10th week	2	3	2	3	7
11th week	2	3	2	3	7
12th week	2	3	2	3	7
13th week	2	3	2	3	8
14th week	2	3	2	3	8
15th week	2	3	2	3	8
Total (hours)	30	45	30	45	

F2F: face-to-face sessions

AW: Non-contact hours in which the student will conduct autonomous work and study.

### 5.5. Bibliography and recommended resources

Bibliography (in Spanish language):

- Paco López-Sánchez, José Luis de. Fundamentos del cálculo hidráulico en los sistemas de riego y drenaje / José Luis de Paco López-Sánchez . Madrid : Mundi-Prensa : MAPA-IRYDA, D.L. 1993 [BB]
- Agua y agronomía / Obra dirigida y coordinada por Francisco Martín de Santa Olalla Mañas, Prudencio López Fuster, Alfonso Calera Belmonte . Madrid : Mundi-Prensa, 2005 [BB. Also available in ebook format]
- Martínez Beltrán, Julián. Drenaje agrícola / Julián Martínez Beltrán . [Madrid] : Secretaría General Técnica, Ministerio de Agricultura, Pesca y Alimentación, 1986 [BB]
- Pizarro Cabello, Fernando. Drenaje agrícola y recuperación de suelos salinos / Fernando Pizarro . 2a ed. Madrid : Agrícola Española, 1985 [BB]
- Riego localizado / J. Rodríguez López...[et al.] . Madrid : IRYDA : Mundi-Prensa, D.L.1992 [BB]
- Castañón León, Guillermo. Ingeniería del riego : utilización racional del agua / Guillermo Castañón . Madrid : Paraninfo, D.L.2000 [BC]
- Chow, Ven Te. Hidráulica de canales abiertos / Ven Te Chow ; traducción , Juan G. Saldarriaga ; revisión técnica, Antonio Zuluaga Angel . [1a. ed.] Santafé de Bogotá : McGraw-Hill, cop. 1994 [BC]
- Escribá Bonafé, Domingo. Hidráulica para ingenieros / Domingo Escribá Bonafé . [1a. ed.] Madrid : Belliso, 1988 [BC]
- Gómez Pompa, Pedro. Instalaciones de bombeo para riego y otros usos / Pedro Gómez Pompa . Madrid : Agrícola Española, D.L.1993 [BC]
- Losada Villasante, Alberto. El riego. II, Fundamentos de su hidrología y de su práctica / A. Losada Villasante . Madrid : Mundi-Prensa, 2005 [BC. Also available in ebook format]
- Tarjuelo Martín-Benito, José M<sup>a</sup>. El riego por aspersión y su tecnología / José M<sup>a</sup> Tarjuelo Martín-Benito . 3<sup>a</sup> ed. rev.

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y amp. Madrid [etc.] : Mundi-Prensa, 2005 [BC. Also available in ebook format]

### Bibliography (in English language):

- Crop evapotranspiration : guidelines for computing crop water requirements / by Richard G. Allen ...[et al.] . Rome : FAO, 1998 [BB]
- Drainage Principles and Applications / H.P. Ritzema (editor-in-chief) . 2nd.ed[completely revised] Wageningen (Netherlands): ILRI,|C1994 [BB]

### eBooks (in Spanish language):

- Tarjuelo Martín-Benito, José María / El riego por aspersión y su tecnología (3a. ed.). Mundi-Prensa, 2008. E-libro: <http://site.ebrary.com/lib/coleccion/docDetail.action?docID=10234512>
- Moya Talens, Jesús Antonio / Riego localizado y fertirrigación (4a. ed.). eISBN: 9788484765226. E-libro: <http://site.ebrary.com/lib/coleccion/docDetail.action?docID=10647384>
- Losada Villasante, Alberto / El riego: II. fundamentos de su hidrología y su práctica. Mundi-Prensa, 2008. pISBN: 9788484762324. E-libro: <http://site.ebrary.com/lib/coleccion/docDetail.action?docID=10228041>
- Santa Olalla Mañas, Francisco Martín de López Fuster, P. Calera Belmonte, A. / Agua y agronomía. Mundi-Prensa, 2008. eISBN: 9781449211516. E-libro: <http://site.ebrary.com/lib/coleccion/docDetail.action?docID=10232431>
- Cadahía López, Carlos / Fertirrigación: cultivos hortícolas, frutales y ornamentales (3a. ed.). Mundi-Prensa, 2008. eISBN: 9781449211714. E-libro: <http://site.ebrary.com/lib/coleccion/docDetail.action?docID=10228052>

Please note that 'BB' stands for basic bibliography and 'BC' stands for complementary bibliography.