

Academic Year/course: 2022/23

## 60566 - Rural facilities and roads

### Syllabus Information

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**Academic Year:** 2022/23

**Subject:** 60566 - Rural facilities and roads

**Faculty / School:** 201 - Escuela Politécnica Superior

**Degree:** 546 - Master in Agricultural Engineering

**ECTS:** 6.0

**Year:** 1

**Semester:** Second semester

**Subject Type:** Compulsory

**Module:**

## 1. General information

### 1.1. Aims of the course

This course and its expected outcomes respond to the following approaches and objectives:

That the student acquires the knowledge and technical skills that will allow him/her to be able to perform the dimensioning and justificatory calculations associated with some of the following rural facilities: small dams and irrigation pools for agricultural use, rural roads, electric power transforming stations (distribution substations) and low-voltage power distribution grids.

#### **SDGs alignment:**

Aforementioned goals are aligned with the following [UN Sustainable Development Goals](#) (SDGs):

- [SDG 6](#): Ensure access to water and sanitation for all.
- [SDG 7](#): Ensure access to affordable, reliable, sustainable and modern energy.
- [SDG 9](#): Build resilient infrastructure, promote sustainable industrialization and foster innovation.

and, in particular, with the following targets:

- *Target 6.4*: By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity [...]
- *Target 6.5*: By 2030, implement integrated water resources management at all levels [...]
- *Target 7.1*: By 2030, ensure universal access to affordable, reliable and modern energy services
- *Target 7.3*: By 2030, double the global rate of improvement in energy efficiency
- *Target 7.A*: By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology
- *Target 9.1*: Develop quality, reliable, sustainable and resilient infrastructure [...]
- *Target 9.4*: By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes [...]

### 1.2. Context and importance of this course in the degree

The Master in Agricultural Engineering degree confers on the holder the professional attributions related to the calculation of rural facilities linked to their field of work. Therefore, this course is essential for the training of an engineer, since the acquired knowledge will be fundamental for the development of the profession in terms of ensuring the safety and proper functioning of this type of facilities.

### 1.3. Recommendations to take this course

Update previous knowledge related to resistance of materials, calculation of structures and electrical engineering and electrical installations. Having pursued the *Rural Infrastructures* course in the first semester is strongly encouraged.

## 2. Learning goals

### 2.1. Competences

Upon passing this course, the students will be more competent to...

- Develop and apply technology related to the management of equipment and installations that are integrated into agri-food production processes and systems.
- Develop and apply technology related to agroindustrial constructions, infrastructures and rural roads.
- Develop and apply technology related to study, intervention and management stages.
- Apply the acquired knowledge and their ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study.
- Possess the learning skills that will allow them to continue studying in a way that will be largely self-directed or autonomous.
- Design, project and execute infrastructure works, buildings, facilities and the equipment necessary for the efficient performance of productive activities carried out in agri-food companies.
- Transmit their knowledge and the conclusions of their studies or reports, using the means that communication technology allows and taking into account the level of knowledge of the receiving public.

### 2.2. Learning goals

To pass this course, the student must demonstrate the following results...

- Describe and justify -from a technical point of view- the elements that constitute a small reservoir.
- Determine the stability of compacted soil slopes.
- Describe and technically justify the elements that constitute a rural road.
- Technically justify the components of a high-voltage/low-voltage transformer substation.
- Technically justify an aerial low-voltage power distribution grid.
- Technically justify an underground low-voltage power distribution grid.

... ensuring that such infrastructures are reliable, sustainable, resilient and of good quality; promoting the adoption of clean and environmentally sound industrial technologies and processes; and using resources more efficiently, complying with the SDGs of the 2030 Agenda referred in section 1.1 (SGDs 6, 7 and 9).

### 2.3. Importance of learning goals

The learning outcomes from this course will allow the student to justify the calculation of some of the most used rural facilities in the field of Agricultural Engineering, in line with one of the specific competences that must be acquired by a Master in Agricultural Engineering degree holder with professional attributions. In the calculation of these facilities, criteria of efficiency, sustainability and reliability will prevail, and distributed energy sources and advanced technologies will be incorporated whenever feasible.

## 3. Assessment (1st and 2nd call)

### 3.1. Assessment tasks (description of tasks, marking system and assessment criteria)

The student must demonstrate that he/she has achieved the anticipated learning outcomes through the following assessment activities:

The evaluation system will be based on a final global test.

This final global test will be similar in the two official calls available per academic year and the scheduled dates will be established by the Center in the academic calendar.

The final global test will consist of three differentiated evaluation activities:

- *Activity 1 (A1)*: written test with short-answer or multiple-choice questions on the contents of block 1 of the course (topics 1 to 3). This activity will be graded from 0 to 10 points and will constitute 30% of the final grade of block 1. It is necessary to obtain at least 4 out of 10 points in this activity to pass the course. The test will be carried out without any supporting documentation.
- *Activity 2 (A2)*: problem-solving written test on the contents of block 1 of the course (topics 1 to 3). This activity will be evaluated from 0 to 10 points and will constitute 70% of the final grade of block 1. It is necessary to obtain at least a 4 out of 10 points in this activity to pass the course. The test can be done with supporting documentation (notes, books, etc.). The use of computers, mobile phones, or internet access is not allowed.
- *Activity 3 (A3)*: Elaboration and presentation of an individual work on the contents of block 2 of the course (topics 4 to 8). The topic will be defined by mutual agreement between the student and the teacher. This activity will be

graded from 0 to 10 points and will correspond to the final grade of block 2. It is necessary to obtain at least 4 out of 10 in this activity in order to pass the subject.

### **Grading system**

The final grade of the course (FG) will be determined by the following equation:

$$CF = [( \text{grade } A1 \times 0.3 + \text{grade } A2 \times 0.7 ) \times 0.4] + [\text{grade } A3 \times 0.6]$$

In order to pass (FG>5) it is compulsory that: NA1 > 4.0; NA2 > 4.0; NA3 > 4.0

In the event that the requirements of the previous section are not met, the final grade will be obtained in the following manner:

If  $FG > 4$ , the final grade will be: Fail (4.0)  
If  $FG < 4$ , the final grade will be: Fail (FG)

In each call, the student will be assessed on 100% of the contents of each block not passed.

### **Evaluation criteria**

The following criteria will be considered:

- The precision and correctness in the answers.
- The correct use of units.
- The chosen approach in the resolution of problems.
- The accuracy of numerical results, as well as their tidiness, presentation and interpretation.
- The clarity in the diagrams, figures and graphic representations.
- Misspellings.
- The absence of explanations and justifications in the development of problems.

### **SDGs integration**

The problems (A2) and individual work (A3) include content strongly aligned with SDGs 7 and 9, and -secondarily- with SDG 6.

### **Success rates in previous academic years**

2018/2019	2019/2020	2020/2021
100%	100%	100%

## **4. Methodology, learning tasks, syllabus and resources**

### **4.1. Methodological overview**

The methodology followed in this course is oriented towards achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as theory sessions (lectures), problem-solving based learning and the use of specific software tools.

### **4.2. Learning tasks**

This is a 6 ECTS course which includes the following learning tasks:

- Lectures.
- Problem-solving sessions.
- Lab sessions (using software tools).
- Autonomous work.
- Assessment activities.

In relation to the SDGs, several of the theory and problem sessions are closely related to SDGs 6, 7 and 9, as indicated in section 4.3 of this syllabus.

### **4.3. Syllabus**

The course will address the following topics:

#### **Theoretical contents:**

1. Electrical substations [SDGs 7 and 9].
2. Low-voltage power distribution grids [SDGs 7 and 9].
3. Compacted soil slope stability.

4. Lighting and interior wiring systems [SDGs 7 and 9].
5. Concrete reservoirs [SDG 6].
6. Small reservoirs for agricultural usage: farm ponds [SDG 6].
7. Large reservoirs for agricultural usage: dams [SDG 6].
8. Rural roads.

**Practical contents:**

Usage of specific software related to:

- Electrical substation design [SDGs 7 and 9].
- Technical justification of low-voltage distribution networks [SDGs 7 and 9].
- Compacted soil slope stability assessment.
- Case of study of a real rural road.

#### 4.4. Course planning and calendar

*Provisional course planning*

Week	Theory sessions (h)	Practice sessions (h)	Autonomous work (h)	Total (h)
1	2	2	6	10
2	2	2	6	10
3	2	2	6	10
4	2	2	6	10
5	2	2	6	10
6	2	2	6	10
7	2	2	6	10
8	2	2	6	10
9	2	2	6	10
10	2	2	6	10
11	2	2	6	10
12	2	2	6	10
13	2	2	6	10
14	2	2	6	10
15	2	2	6	10
<b>Total</b>	30	30	90	150

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course will be provided on the first day of class.

#### 4.5. Bibliography and recommended resources

- BB** Dal-Ré Tenreiro, Rafael. Caminos rurales : proyecto y construcción / Rafael Dal-Ré Tenreiro. Madrid : Mundi-Prensa : IRYDA, 1994
- BB** Manual para el diseño, construcción, explotación y mantenimiento de balsas / [Centro de Estudios y Experimentación de Obras Públicas (CEDEX)]. 1ª ed. Madrid : Comité Nacional Español de Grandes Presas, 2010

- BB** MORENO ALFONSO, N. RCE: reglamento sobre centrales eléctricas, subestaciones y centros de Transformación. [S. I.]: Tebar Flores, 2002. ISBN 978-1-4492-3163-7.
- BB** MUJAL, R. M. Cálculo de líneas y redes eléctricas. [S. I.]: Universitat Politècnica de Catalunya, 2013. ISBN 978-84-7653-987-3.
- BB** Pequeños embalses de uso agrícola / coordinador y director, Rafael Dal-Ré Tenreiro ; con la participación como autores de, Francisco Ayuga Téllez ... [et al.]. Madrid [etc.] : Mundi-Prensa, 2003
- BB** REBT con tests y ejercicios de cálculo. [S. I.]: Cano Pina, 2015. ISBN 978-84-15884-29-3.
- BC** Bacigalupe Camarero, Fernando. Líneas aéreas de media y baja tensión : cálculo mecánico / Fernando Bacigalupe Camarero. Madrid : Paraninfo, cop. 2000
- BC** Cruz Gómez, José Manuel de la. Instalaciones de puesta a tierra y protección de sistemas eléctricos / José Manuel de la Cruz Gómez, Jacinto Gallego Calvo, Tarsicio Trujillo del Campo. Barcelona : Ediciones Experiencia, [2005]
- BC** FERNÁNDEZ BARRANCO, F. MF0823\_2 Montaje y mantenimiento de redes eléctricas aéreas de baja tensión. [S. I.]: Cano Pina, 2016. ISBN 978-84-16338-51-1.
- BC** GARCÍA MÁRQUEZ ROBLLEDILLO, V.; GONZÁLEZ JIMÉNEZ, J.; GONZÁLEZ PÉREZ, J. Eficiencia energética en las instalaciones de iluminación interior y alumbrado exterior (UF0567).[S. I.]: IC Editorial, 2016. ISBN 978-84-16271-45-0.
- BC** GONZÁLEZ PÉREZ, J.; GONZÁLEZ JIMÉNEZ, J. Mantenimiento de centros de transformación: montaje y mantenimiento de redes eléctricas de alta tensión de 2ª y 3ª categoría y centros de transformación (UFO998). [S. I.]: IC Editorial, 2012. ISBN 978-84-15942-22-1.
- BC** GUERRERO PÉREZ, R. Montaje y mantenimiento de transformadores: montaje y mantenimiento de instalaciones eléctricas de baja tensión (UF0896). [S. I.]: IC Editorial, 2012. ISBN 978-84-15670-56-8.
- BC** LEBRÓN GARCÍA, J. C. Operaciones de tendido y tensado de conductores en redes eléctricas aéreas y subterráneas: operaciones auxiliares de montaje de redes eléctricas (MF0819\_1). [S. I.]: IC Editorial, 2012. ISBN 978-1-4492-9039-9.
- BC** MENDOZA RAMÍREZ, A. J. Montaje de redes eléctricas aéreas de baja tensión: montaje y mantenimiento de instalaciones eléctricas de baja tensión (UF0892). [S. I.]: IC Editorial, 2012. ISBN 978-84-15670-53-7.
- BC** MIRALLES, J.; MORENO, F.; ZUBIAURRE LUSA, J. Instalaciones eléctricas interiores. [S. I.]: Cano Pina, 2014. ISBN 978-84-15884-16-3.
- BC** SÁNCHEZ MONCAYO, J. M. Operaciones de montaje de apoyos en redes eléctricas aéreas (MF0818\_1). [S. I.]: IC Editorial, 2012. ISBN 978-1-4492-8930-0.
- BC** Sanz Serrano, José Luis. Instalaciones eléctricas : resumen del Reglamento Electrotécnico de Baja Tensión (BOE 2002) : esquemas, aplicaciones y ejercicios resueltos de acuerdo con el R.E.B.T. / José Luis Sanz Serrano. Madrid [etc.] : Thomson Paraninfo, D.L. 2003
- BC** Villalba Clemente, Carlos. Ejercicios prácticos resueltos con dmELECT, CIEBT-VIVI [recurso electrónico] Carlos Villalba Clemente, Jesús Suárez Vivanco, Sergio Valero Verdú. San Vicente [del Raspeig], Alicante : Club Universitario, 2013

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[[http://info.igme.es/SidPDF/065000/075/65075\\_0001.pdf](http://info.igme.es/SidPDF/065000/075/65075_0001.pdf)]

Cárcel Carrasco, F.J., Sánchez Rodríguez, J.M. (2015). Centros de transformación MT/BT integrado en obra civil. Valencia

[<http://www.3ciencias.com/libros/libro/centros-de-transformacion-mtbt-integrados-en-obra-civil-para-distribucion-de-energia->

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The updated recommended bibliography can be consulted in:<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=60566>