



Universitat de Lleida

DEGREE CURRICULUM

AGRO-INDUSTRIAL BUILDING AND ELECTRIFICATION

Coordination: ROSELL POLO, JOAN RAMON

Academic year 2021-22

Subject's general information

Subject name	AGRO-INDUSTRIAL BUILDING AND ELECTRIFICATION			
Code	102585			
Semester	2nd Q(SEMESTER) CONTINUED EVALUATION			
Typology	Degree	Course	Character	Modality
	Bachelor's Degree in Agricultural and Food Engineering	3	COMPULSORY	Attendance-based
Course number of credits (ECTS)	6			
Type of activity, credits, and groups	Activity type	PRACAMP	PRALAB	PRAULA
	Number of credits	0.3	1.2	1.2
	Number of groups	1	1	1
Coordination	ROSELL POLO, JOAN RAMON			
Department	AGRICULTURAL AND FOREST ENGINEERING			
Teaching load distribution between lectures and independent student work	Classroom hours: 60 No classroom hours: 90			
Important information on data processing	Consult this link for more information.			
Language	catalan / spanish			

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
FERNÁNDEZ SERRANO, ÁLVARO	alvaro.fernandezserrano@udl.cat	3	
ROSELL POLO, JOAN RAMON	joanramon.rosell@udl.cat	3	

Subject's extra information

Subject / matter in the whole curriculum

The course is compulsory within the specialty of Agricultural and Food Industries and deals with the construction and electrical installations necessary for the development of the activities of the specialty.

Requirements to take it

prerequisites:

Foundations of Rural Engineering

Construction

recommendations

Regularly consult the Virtual Campus and UdL email.

Information on the transmission and recording of personal data of teachers and students of the University of Lleida as a result of teaching at the UdL facilities and remotely

The University of Lleida informs that, depending on the changes to which it is forced in accordance with the instructions of the health authorities, the mobility provisions or the quality assurance of teaching, it can transmit, record and use the image, voice or, where appropriate, the physical environment chosen by teachers and students, with the aim of teaching at the UdL facilities and at a distance.

In turn, it encourages the people affected so that, in the case of distance teaching, they choose the spaces that have the least impact on their privacy. And, in general, it is recommended to preferably opt for interactions in chat or without activating the camera, when teaching activities are not carried out that, due to their characteristics, require oral or visual interaction.

The person responsible for the recording and use of these personal data is the University of Lleida -UdL- (contact details of the representative: General Secretariat. Plaza de Víctor Siurana, 1, 25003 Lleida; sg@udl.cat; contact details of the data protection officer: dpd@udl.cat).

These personal data will be used exclusively for the purposes inherent to the teaching of the subject. In particular, the recording fulfills the following functions:

- Offer the possibility of accessing content online and, where appropriate, by way of asynchronous training.
- Guarantee access to content for students who, for technological, personal or health reasons, among others, have not been able to participate.

- To constitute a study material for the preparation of the evaluation.

The use of transmitted data and recordings for other purposes, or in areas outside the Virtual Campus, where they will remain archived, in accordance with the intellectual and industrial property policy of all content included on websites owned by the UdL, is absolutely prohibited. .

If any, the recordings will be kept for as long as the person who teaches the subject decides, in accordance with strictly academic criteria, and, at most, they must be eliminated at the end of the current academic year, under the terms and conditions provided in the regulations on conservation and elimination of the administrative documents of the UdL, and the documentary evaluation tables approved by the Government of Catalonia (<http://www.udl.cat/ca/serveis/arxiu/>).

These personal data are essential to teach the subject, and the definition of the teaching procedures, especially that done remotely, is a power of the UdL within the framework of its right to university autonomy, as provided by the Article 1.1 and Article 33.1 of Organic Law 6/2001, of December 21, on universities. For this reason, the UdL does not need the consent of the people affected by transmitting or recording their voice, the image and, where appropriate, the physical environment they have chosen, for this exclusive purpose, of teaching the subject.

The UdL will not transfer the data to third parties, except in the cases strictly provided for in the Law. The affected persons can access their data; request its rectification, deletion or portability; object to the treatment and request the limitation, provided that it is compatible with the teaching purposes, by means of a letter sent to the address dpd@udl.cat. They can also file a claim addressed to the Catalan Data Protection Authority, through the Authority's electronic headquarters (<https://seu.apd.cat>) or by non-electronic media.

Learning objectives

Students in overcoming the course should be able to:

- R1: Know and understand concrete composition and properties.
- R2: Calculate actions on structures according to CTE.
- R3: Calculate combinations of actions for every structural member according to CTE.
- R4: Size steel structural members (purlins, beams, column) according to CTE.
- R5: Use professional structural design software
- R6: Knowing and understanding the rules, components and features a low voltage electrical installation.
- R7: Design and calculate an electrical installation of a food industry.
- R8: Know the operation of electrical machines and compute its characteristic parameters.
- R9: Understand and measure the main systems for rural electrification: conventional and alternative.
- R10: Understand and apply techniques for optimizing power consumption and regulations on electric rates.

Competences

General skills

At least the following basic skills are guaranteed:

CG1. Capacity for the preparation, design, drafting and signing of projects aimed at the construction, alteration, repair, maintenance, demolition, manufacturing, installation, assembly or operation of real or personal property which by its nature and characteristics remain included in the technical characteristic of the agricultural and livestock production (facilities or buildings, farms, rural infrastructure and roads), food industry (extractive industries, fermentation, dairy, canning, fruit and vegetables, meat, fishing, salting and generally any other

dedicated to the production and / or processing, preservation, handling and distribution of food) and gardening and landscape (urban green spaces and / or rural, parks, gardens, nurseries, urban trees, etc., sports facilities and public and private environments subjected to landscape recovery).

CG2. Adequate knowledge of physical problems, technologies, machinery and systems for energy and water supply, the limits imposed by budgetary factors and regulations and constructive relations between facilities or buildings and farms, food processing industries and related areas gardening and landscaping with its social and environmental as well as the need to interact with this environment and those human needs and environmental preservation.

CG3. Ability to lead the execution of the works object of projects relating to agribusiness, farms and green spaces and its buildings, infrastructure and facilities, prevention of risks associated with the implementation and management of multidisciplinary human teams resource management, in accordance with ethical standards.

CG8. Ability to solve problems with creativity, initiative, methodology and critical reasoning.

CG10. Ability to research and use of the rules and regulations relating to its scope.

CG12. Ability to work in multidisciplinary and multicultural teams.

CT1. Correction in speaking and writing.

CT3. Mastery of Information and Communications Technology.

Specific skills

CEIAA2. Ability to learn, understand and use the principles of: Engineering of the agri-food industries. Auxiliary equipment and machinery of the agri-food industry. Automation and process control. Engineering of works and facilities. Agro-industrial constructions. Waste management and use.

Subject contents

Syllabus

- **Unit 1:** Actions in the building. Combinations of actions. CTE. Ultimate Limit State. Serviceability Limit State.
- **Unit 2:** Concrete. Standards, EHE. Composition. Durability. Dosage. Sizing structural members of reinforced concrete.
- **Unit 3:** Sizing steel structural members. I-beams. Internal forces. Compression and tension stress. Elastic limit. Shear force. Buckling.
- **Unit 4:** Low Voltage Electrical Installations (IEBT). Review of alternating currents. Regulations for LVEI. Elements and features of LVEI. Security in LVEI. Design and calculation of LVEI. The electrical project in LVEI. Documentation.
- **Unit 5:** Electrical machines (EM). General principles of EM. Power converters. Rotary DC EM. rotary AC EM. special EM. Protection of the ME. Principles of EM automation.
- **Unit 6:** Systems for Rural Electrification. Optimizing power consumption. Electricity rates. Power lines. Transformers. Generators. Renewable energy. Photovoltaic installations. Guidelines and techniques for saving and optimization of power consumption. Pricing and cost of electricity.

Practical activities

- Resolution of exercises and examples in the classroom.
- Resolution of case studies with computer.

Methodology

AGRO-INDUSTRIAL BUILDING AND ELECTRIFICATION 2021-22

BLOCS		Lectures and problems solving (hours)		Practices with the computer (hours)		Evaluation (hours)	TOTAL (hours)	
		Classroom / Homework		Classroom / Homework		Classroom	Classroom / Homework	
1	Introduction	2					2	
2	Unit 1						12	18
	Theory and problems solving	6	10					
	Actions on structures calculation with computer			4	8			
	Exam unit 1					2		
3	Unit 2						4	6
	Theory and problems solving	4	6					
4	Unit 3						12	21
	Theory and problems solving	5	10					
	Sizing structural steel members with computer			5	11			
	Exam units 2 & 3					2		
5	Unit 4						14	21
	Theory and problems solving	12	21					
	Exam unit 4					2		
6	Unit 5						7	12
	Theory and problems solving	7	12					
7	Unit 6						9	12
	Theory and problems solving	7	12					
	Exam units 5 & 6					2		
TOTAL							60	90

Type of activity	Presencial activity of the student	Not Presencial activity of the student
Lectures and problems volving	Introduction and exposition of the concepts and theoretical foundations. Introduction and application of concepts through problem solving.	Study of the theoretical concepts that allow solving problems. Problems solving.
Computer	Problems solving with professional structural design software	Problems solving with professional structural design software

Development plan

Type of Activity	Content	Object	Classroom hours	Accumulated hours	Evaluation	
					Unit	Time (h)
Lecture	Introduction	General overview.	1	1		
Lecture. Problems solving	Unit 1. Review of reactions, internal stresses and stresses in beams	R4	1	2		
Lecture. Problems solving	Unit 1. Calculation of actions in the building (CTE)	R2	3	5		
Lecture. Problems solving	Unit 1. Combination of actions (CTE)	R3	3	8		
Computer practices	Unit 1. Calculation and combinations of actions (CTE)	R2,R3	4	12		
				14	Unit 1	2
Lecture. Problems solving	Unit 2. Components and dosage of concrete	R1	2	16		
Lecture. Problems solving	Unit 2. Calculation of simple sections of reinforced concrete.	R1	2	18		
Lecture. Problems solving	Unit 3. Calculation of sections without binding..	R4	1	19		

Lecture. Problems solving	Unit 3. Compression bonding.	R4	1	20		
Lecture. Problems solving	Unit 3. Flexural bonding.	R4	2	22		
Lecture. Problems solving	Unit 3. Binding in combination of bending and compression.	R4	2	24		
Computer practices	Unit 3. Sizing of steel beams	R4	4	28		
				30	Units 2 and 3	2
Lecture	Unit 4. Review of alternating currents	R5, R6	1	31		
Lecture	Unit 4. Regulations for Low voltage electrical installations, LVEI. Elements and characteristics of an LVEI..	R5, R6	4	35		
Lecture. Problems solving	Unit 4. LVEI design and calculation. Section of conductors.	R5, R6	4	39		
Lecture. Problems solving	Unit 4. Security of the LVEI. The electrical project in LV. Documentation.	R5, R6	3	42		
				44	Unit 4	2
Lecture	Unit 5. General principles of Electrical machines.	R7	1	45		
Lecture	Unit 5. Electric power converters Transformers	R7	1	46		
Lecture	Unit 5. DC and AC rotary electrical machines.	R7	3	49		
Laboratory practices	Unit 5. Electrical machines	R7	2	51		

Lecture	Unit 6. Power lines.	R8	1,5	52,5		
Lecture	Unit 6. Transformation Centers. Generators.	R8	1	53,5		
Lecture	Unit 6. Renewable energies.	R8	2,5	56		
Lecture	Unit 6. Electricity efficiency and savings. Electricity rates.	R9	2	58		
				60	Units 5 and 6	2
					final recovery Exam	2

Evaluation

Type of activity	results of the learning	Procedure	Qualification weight (%)
Unit 1	R2, R3, R4	Exam	17,5
Unit 1	R2, R3, R4	Computer work	7,5
Units 2 and 3	R1, R4	Exam	17,5
Units 2 and 3	R1, R4	Computer work	7,5
Unit 4	R6, R7	Exam	25
Units 5 and 6	R8, R9, R10	Exam	25
TOTAL			100

Pass criteria

- Average mark equal or higher than 5.0
- Marks of each exam or work equal or higher than 4.0

Exams

- For exams of units 1, 2 and 3 students are allowed to use documentation (written or printed) .
- For exams of units 4,5 and 6 the only documentation that will be available is a formulas sheet prepared by the students themselves.
- During the exams it is not allowed to use computers, mobile phones, watches or any other kind of device that allows connection to the internet or with other people.

General criteria

- The formal correctness of the documents submitted by students, whether in exams or problems, is demanded. It is not possible to pass the course if this requirement is not fulfilled. Special attention about the spelling must be paid.
- When correcting exams and practices, the absence or incorrectness of the units in the numerical results, the misconceptions, errors or rude contradictions will be especially penalized. The presence of some of the error described here may be enough to cause an examination to be qualified as not passed.

Bibliography

Basic bibliography

Ministerio de Vivienda. 2006. CTE DB SE. *Bases de cálculo*. Madrid: Ministerio de Vivienda.

Disponible en web: http://www.codigotecnico.org/cte/export/sites/default/web/galerias/archivos/DB_SE_abril_2009.pdf

Ministerio de Vivienda. 2006. CTE DB SE-AE. *Acciones en la edificación*. Madrid: Ministerio de Vivienda. Disponible en web: www.codigotecnico.org/cte/export/sites/default/web/galerias/archivos/DB_SE-AE_abril_2009.pdf

Ministerio de Fomento. 2011. EHE-08. *Instrucción de Hormigón Estructural*. Madrid: Ministerio de Fomento. Disponible en web: www.fomento.gob.es/NR/rdonlyres/029BEBA6-A895-40E4-BA9F-FD0D75E3B865/107241/5EHE2008ultimo.pdf

Ministerio de Vivienda. 2006. CTE DB SE-A. *Acero*. Madrid: Ministerio de Vivienda. Disponible en web: www.codigotecnico.org/cte/export/sites/default/web/galerias/archivos/CTE_Parte_2_DB_SE-A.pdf

Luna Sánchez, L *et al.* 2008. *Instalaciones eléctricas de baja tensión en el sector agrario y agroalimentario*. Madrid: Ediciones Mundi-Prensa.

García Trasancos, J. 2004. *Instalaciones eléctricas en media y baja tensión*. 4ª ed. Madrid: Paraninfo

García Trasancos, J. 2006. *Electrotecnia*. 9ª ed. Madrid: Thomson-Paraninfo. Ministerio de Ciencia y Tecnología. 2002. Reglamento electrotécnico para baja tensión e instrucciones técnicas complementarias. Real Decreto 842/2002, de 2 de agosto; BOE del 18 de septiembre de 2002 (suplemento).

Roger Folch, J., Riera Guasp, M., Roldán Porta, C. 2010. *Tecnología Eléctrica* (3ª edición) Editorial Síntesis, S.A.

Complementary bibliography

Gere JM. 2002. *Resistencia de materiales*. 5ª ed. Madrid: Paraninfo.

García Meseguer A, Moran F y Arroyo JC. 2009. *Jiménez Montoya. Hormigón armado*. 15ª ed. Barcelona: Gustavo Gili.

Monfort J. 2006. *Estructuras metálicas para edificación*. Adaptado al CTE. Valencia: Editorial UPV.

Monfort J, Pardo JL y Guardiola A. 2008. *Problemas de estructuras metálicas adaptados al Código Técnico*. Valencia: Editorial UPV.

Rosell J.R. 2000. *Circuitos eléctricos monofásicos y trifásicos. Fundamentos teóricos y ejercicios resueltos*. Lleida: Ed. Universitat de Lleida.

Rosell J.R. 2022. Circuits elèctrics monofàsics i trifàsics. Fonaments teòrics i exercicis resolts .Unedited teaching material.

Martínez F. 2004. Instalaciones eléctricas de alumbrado e industriales. 4ª ed. Madrid: Thomson-Paraninfo.

Sanz J.L. 2005. Instalaciones eléctricas. Soluciones a problemas en baja y alta tensión. Madrid: Thomson-Paraninfo.

Wildi T. 2007. Máquinas eléctricas y sistemas de potencia. 6ª ed. México: Pearson-Prentice Hall.

Barrero González, F., González Romera, E., Milanés Montero, M. I., Romero Cadaval, E. 2012. Fundamentos de Instalaciones Eléctricas. Editorial GARCETA.