



Universitat de Lleida

DEGREE CURRICULUM

MACHINERY, BUILDINGS AND LIVESTOCK EQUIPMENT

Coordination: PUIGDOMENECH FRANQUESA, LUIS

Academic year 2022-23

Subject's general information

Subject name	MACHINERY, BUILDINGS AND LIVESTOCK EQUIPMENT				
Code	102556				
Semester	1st Q(SEMESTER) CONTINUED EVALUATION				
Typology	Degree	Course	Character	Modality	
	Bachelor's Degree in Agricultural and Food Engineering	4	COMPULSORY	Attendance-based	
	Master's Degree in Agronomic Engineering		COMPLEMENTARY TRAINING	Attendance-based	
Course number of credits (ECTS)	6				
Type of activity, credits, and groups	Activity type	PRACAMP	PRALAB	PRAULA	TEORIA
	Number of credits	0.2	0.6	1.3	3.9
	Number of groups	1	1	1	1
Coordination	PUIGDOMENECH FRANQUESA, LUIS				
Department	AGRICULTURAL AND FOREST ENGINEERING				
Teaching load distribution between lectures and independent student work	Classroom time : 60 Homework time: 90				
Important information on data processing	Consult this link for more information.				

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
ARNO SATORRA, JAIME	jaume.arno@udl.cat	1	
ESCOLA AGUSTI, ALEXANDRE	alex.escola@udl.cat	1	
PUIGDOMENECH FRANQUESA, LUIS	lluis.puigdomenech@udl.cat	2	
ROSELL POLO, JOAN RAMON	joanramon.rosell@udl.cat	2	

Subject's extra information

Subject / subject in the whole curriculum

The subject, compulsory within the specialty of Agricultural Production, deals with the machinery, the constructions and the necessary facilities for the development of the own activities of the specialty.

Corequisites:

Fundamentals of Agricultural Engineering

Construction

Recommendations:

Consult regularly the Virtual Campus

Learning objectives

The student should be able to:

1. Recognize the **functions** of constructive elements in livestock housing and **orders of magnitude**.
2. Perform simple **structural calculation**.
3. Know how to **order** concrete and **design** footings for livestock housing.
4. Know and understand the **Regulations**, the components and characteristics of a **Low Voltage** installation.
5. **Design and calculate** an electrical installation of a livestock farm.
6. Know the operation of **electrical machines**.
7. Know the main **systems** for Rural Electrification: conventional and alternative.
8. Know and apply techniques to optimize energy **consumption** and Regulation about Electricity **Rates**.
9. Know and understand the basic characteristics of the **tractors** and the main **agricultural machinery**, comparing the most important parameters.
10. Have a good knowledge of the scientific method and its importance in the **regulations, experimental demonstrations and tests** of agricultural machines.
11. Know the **risks** involved in the use of agricultural machinery and how to prevent them.

Competences

Specific competences

The syllabus is developed taking into account the specific competencies of:

CEE3. Ability to know, understand and use the principles of: Engineering of farms. **Electrification of farms.** **Agricultural machinery.** Irrigation systems and technology. **Agro-farming constructions.** Facilities for animal health and welfare.

Subject contents

SECTION I: CONSTRUCTION

- **Unit 1: Beam** as a constructive element. **Enclosures** in agro-industrial warehouse. Roofs and floors. Brick walls, precast plates and concrete walls. **Transmission of loads.**
- **Unit 2: Structural design.** Demands Actions. Combination of actions. Load hypothesis. Use of CYPE.
- **Unit 3: Concrete.** Order. Footings

SECTION II: INSTALLATIONS

- **Unit 4: Low voltage electrical installations (LVEI).** Review of alternating currents. Regulations for LVEI. Elements and characteristics of an LVEI. Security of the LVEI. Design and calculation of LVEI. The electric project in LV. Documentation.
- **Unit 5: Electrical machines (EM).** General principles of EM. Power converters. EM rotary of continuous current. EM rotary alternating current EM specials Protection of EM. Principles of EM automation.
- **Unit 6: Systems for rural electrification.** Optimization of electricity consumption. Electric rates. Power lines Transformation centers. Generators Renewable energies. Photovoltaic installations. Guidelines and techniques for saving and optimizing the consumption of electrical energy. Tariff and economic cost of electricity.

BLOCK III: AGRICULTURAL MACHINERY

- **Unit 7: Mechanization in arable crops.** Works, techniques and machinery. Costs of use and yields of agricultural machinery.
- **Unit 8: The agricultural tractor.** Use of the tractor in the agricultural farm and classification. Review of engine and transmission. Steering, brakes and rolling systems. The tractor-machinery union. Load transfer. Traction mechanics. Rolling resistance. Adherence Slip. Selection and uses of the tractor.
- **Unit 9: Machinery for soil tillage.** Technical principles of tillage. Machinery for primary crops. Machinery for secondary cultivation.
- **Unit 10: Machinery for seeding.** Seeding systems: seed broadcasters, seed drills (in rows), single seed drills, direct seeding. Combined seeding equipment.
- **Unit 11: Machinery for the distribution of fertilizers.** Fertilizer spreaders of mineral and solid organic fertilizers.
- **Unit 12: Machinery for the application of plant protection products.** Sprayers. New technologies for the

application of plant protection products.

Practical activities

- Resolution of practical cases with a computer.
- Visit
- Exercise and sample resolution in the classroom.
- Tractor practice
- Regulation and testing of application equipment.

Methodology

The subject is organised in three independent blocks. See Development plan. Classes are basically given in Catalan.

Development plan

Activity	Contents	Scope	Presential hours	Accumulated hours	Evaluation		
BLOCK I					Part	Value	Time (h)
Cases	Unit 1. Structural design scope and Standards. RdM review. Beam identification in agricultural constructions	R2	2	2			
Lecture	Unit 1. Enclosures characteristics and ties with structures. Load transmission	R1	2	4			
Lecture	Unit 2. Structural materials. Requirements. Limit states.	R2	2	6			
Problem resolution	Unit 2. Actions. Load combinations.	R2	2	8			
Computer class	Unit 2. CYPE use and rough calculations	R2	6	14			
Lecture	Unit 3. Reinforced concrete. Description and order	R3	2	16			
Problem resolution	Unit 3. Foundations by footings	R3	4	20			
					Temes 1,2&3 Exam	32 %	2 h
BLOCK II							
Lecture	Unit 4. Introduction and Alternate current review	R4, R5	1	21			

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Lecture	Unit 4. Low Voltage Electrical Installations (LVEI) Standards. Elements and characteristics of LVEI	R4, R5	2	23			
Lecture Problem resolution	Unit 4. Design and calculus of LVEI. Cable section	R4, R5	3,5	26,5			
Lecture. Problem resolution	Unit 4. Security of LVEI. The electrical project in LV. Documentation	R4, R5	3,5	30			
Lecture	Unit 5. General principles of Electrical Machines EM	R6	1	31			
Lecture	Unit 5. Power converters-Transformers-Transformation Centers	R6	1	32			
Lecture	Unit 5. CC and CA rotative electrical machines	R6	3	35			
Lecture	Unit 6. Electrical power lines	R7	1	36			
Lecture	Unit 6. Renewable energies	R7	2,5	38,5			
Lecture	Unit 6. Efficiency and savings in electric energy. Electrical rates	R8	1,5	40			
					Themes 4, 5 & 6 Exam	34 %	2 h
BLOCK III							
Lecture	Unit 7. Mechanization of arable crops	R9, R10 & R11	2	42			
Lecture	Unit 8. Farm tractor	R9, R10 & R11	6	48			
Lecture	Unit 9. Tillage	R9, R10 & R11	2	50			
Lecture	Unit 10. Seeders	R9, R10 & R11	2	52			
Lecture	Unit 11. Fertilizer spreaders	R9, R10 & R11	2	54			
Lecture	Unit 12. Sprayers	R9, R10 & R11	2	56			
Laboratory practices	Units 10, 11 & 12	R9, R10 & R11	2	58	Units 10, 11 & 12	8 %	
Technical visit	Units 7, 8, 9, 10, 11 & 12	R9, R10 & R11	2	60			

					Themes 7,8 & 9 Exam	26 %	2 h
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Evaluation

Chapters	Procedure	Weight
Theme 1, 2 & 3	Exam	32 %
Theme 4, 5 & 6	Exam	34 %
Theme 7, 8, 9, 10, 11 & 12	Report of practices Exam	8 % 26 %

Observations

You must pass every block. However, ONE block could be compensated with a minimum punctuation of 4. If you fail two blocks, the subject will be considered failed. At first instance, if you failed the subject, you could have a final exam, having to pass every block failed.

Bibliography

Basic references

MINISTERIO DE FOMENTO. 2009. Código Técnico de la Edificación, Documento Básico, Seguridad Estructural, Acciones en la Edificación (CTE-DB-SE-AE) www.codigotecnico.org . Ley 38/1999

MINISTERIO DE FOMENTO. 2008. Código Técnico de la Edificación, Documento Básico, Seguridad Estructural, Cimientos (CTE-DB-SE-C) www.codigotecnico.org . Ley 38/1999

Mº de TRANSPORTES, MOVILIDAD Y AGENDA URBANA. 2021. Código Estructural

Jiménez Montoya P *et al.* 2009. *Hormigón armado*. 15ª ed. Barcelona: Gustavo Gili.

Benilde Bueno, Reglamento Electrotécnico para Baja Tensión. Barcelona: Ed. Marcombo 2020.

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 TECNOLOGIA. 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).

Cédra, C. 1991. *Les tracteurs agricoles*. Paris: Ed. Tec & Doc.

Márquez, L. 2012. *Tractores agrícolas: tecnología y Utilización*. Madrid: B&H Editores

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

teaching material.

Vásquez, J. 2003. *Aplicación de productos fitosanitarios: técnicas y equipos*. Madrid: Ediciones Agrotécnicas,