



Universitat de Lleida

DEGREE CURRICULUM  
**INTEGRATED PRACTICE:  
ENGINEERING AND  
MANAGEMENT**

Coordination: COTS RUBIO, LLUIS

Academic year 2022-23

Subject's general information

<b>Subject name</b>	INTEGRATED PRACTICE: ENGINEERING AND MANAGEMENT			
<b>Code</b>	102545			
<b>Semester</b>	1st Q(SEMESTER) CONTINUED EVALUATION			
<b>Typology</b>	<b>Degree</b>	<b>Course</b>	<b>Character</b>	<b>Modality</b>
	Bachelor's Degree in Agricultural and Food Engineering	4	COMPULSORY	Attendance-based
<b>Course number of credits (ECTS)</b>	6			
<b>Type of activity, credits, and groups</b>	<b>Activity type</b>	PRACAMP	PRAULA	TEORIA
	<b>Number of credits</b>	0.7	4.1	1.2
	<b>Number of groups</b>	1	1	1
<b>Coordination</b>	COTS RUBIO, LLUIS			
<b>Department</b>	AGRICULTURAL AND FOREST ENGINEERING			
<b>Teaching load distribution between lectures and independent student work</b>	Lectures: 60 h Independent student work: 90 h			
<b>Important information on data processing</b>	Consult <a href="#">this link</a> for more information.			
<b>Language</b>	Catalan: 90% Spanish: 10%			
<b>Distribution of credits</b>	Carlos Cantero Martínez 0,3 Luis F. Gosalvez Lara 0,3 Lluís Martín Closas 0,3 Josep Maria Villar Mir 1,2 José Millán Gómez 0,3 Àlvaro Fernández Serrano 1,5 Joan Ramon Rosell Polo 0,5 Lluís Cots Rubió 1,6			

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
CANTERO MARTINEZ, CARLOS	carlos.cantero@udl.cat	,3	
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## Subject's extra information

### Subject in the whole curriculum

It aims to apply all the knowledge gained in the field of all subjects in a real case study.

### Recommendations

It is advisable to have a sense of synthesis of all the subjects studied during the degree and especially of the engineering subjects to be able to apply them correctly in the practical case that arises.

### Covid-19

Due to causes arising from the health crisis caused by Covid-19, face-to-face activities can be replaced by other equivalents in distance mode.

## Learning objectives

### Objectives and learning outcomes

The aim is for students to be trained in solving a case study focused on the field of specific technology in rural and environmental engineering. Students will have to make a study of the conditions and from there establish the production plan and the necessary engineering.

The aspects to study in the work will be:

1. Characterization of the conditions of the physical environment, irrigation, the developer, socio-economic, environmental and legal, etc.
2. Study and choice of alternatives to the production plan
3. Necessary engineering
4. Financial and economic evaluation of the investment
5. Presentation of the conclusions following the professional formats of projects (report and annexes, plans, budget and specifications)

## Competences

### General skills

CB1. That students have demonstrated to possess and understand knowledge in an area of study that starts from the base of general secondary education, and is usually found at a level that, although supported by advanced textbooks, also includes some aspects that imply knowledge from the forefront of your field of study.

CB2. That students know how to apply their knowledge to their work or vocation in a professional way and possess the competencies that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study.

CB3. That students have the ability to gather and interpret relevant data (usually within their area of study) to make judgments that include reflection on relevant issues of a social, scientific or ethical nature.

CB4. That students can transmit information, ideas, problems and solutions to both specialized and non-specialized audiences.

CB5. That students have developed those learning skills necessary to undertake further studies with a high degree of autonomy.

CG1. Capacity for the prior preparation, conception, drafting and signing of projects that have as their object the construction, reform, repair, conservation, demolition, manufacture, installation, assembly or exploitation of movable or immovable property that due to its nature and characteristics are included in the own technique of agricultural and livestock production (facilities or buildings, farms, infrastructures and rural roads), the agrifood industry (extractive, fermentation, dairy, canning, fruit and vegetable, meat, fishing, salting industries and, in general, any other dedicated to the elaboration and / or transformation, conservation, handling and distribution of food products) and gardening and landscaping (urban and / or rural green spaces, parks, gardens, nurseries, urban trees, etc., public or private sports facilities and environments subjected to landscape restoration).

CG2. Adequate knowledge of physical problems, technologies, machinery and water and energy supply systems, the limits imposed by budgetary factors and construction regulations, and the relationships between facilities or buildings and agricultural holdings, agrifood industries and spaces related to the gardening and landscaping with their social and environmental surroundings, as well as the need to relate those and that environment with human needs and the preservation of the environment.

CG3. Ability to direct the execution of the works object of the projects related to agrifood industries, agricultural operations and green spaces and their buildings, infrastructures and facilities, the prevention of risks associated with this execution and the management of multidisciplinary teams and human resource management, in accordance with deontological criteria.

CG4. Ability to write and sign measurements, segregations, subdivisions, evaluations and appraisals within the rural environment, the technique of the agrifood industry and spaces related to gardening and landscaping, whether or not they have the character of expert reports for judicial bodies or administrative, and regardless of the use to which the movable or immovable property object of the same is allocated.

CG5. Ability to write and sign rural development studies, environmental impact and waste management of the agrifood industries, agricultural and livestock operations, and spaces related to gardening and landscaping.

CG6. Ability to direct and manage all kinds of agri-food industries, agricultural and livestock farms, urban and / or rural green spaces, and public or private sports areas, with knowledge of new technologies, quality processes, traceability and certification and the marketing techniques and commercialization of food products and cultivated plants.

CG7. Knowledge of basic, scientific and technological subjects that allow continuous learning, as well as an ability to adapt to new situations or changing environments.

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

CG9. Leadership, communication and transmission of knowledge, abilities and skills in the social fields of action.

CG10. Ability to search and use the rules and regulations related to its scope of action.

CG11. Ability to develop their activities, assuming a social, ethical and environmental commitment in tune with the reality of the human and natural environment

CG12. Ability to work in multidisciplinary and multicultural teams.

CT1. Correction in oral and written expression.

CT3. Mastery of Information and Communication Technologies.

CT4. Respect for the fundamental rights of equality between men and women, the promotion of Human Rights and the values of a culture of peace and democratic values.

## **Specific skills.**

CEMCR1. Technologies of plant and animal production. Ability to know, understand and use the principles of: Plant breeding; Biotechnology and plant breeding; Crops; Crop protection; Gardening and Landscaping. Sport zones. Nutrition. Hygiene and animal production systems. Biotechnology and Animal Improvement. Animal products.

CEMCR2. Ability to know, understand and use the principles of: Bases and technology of rural buildings. Soil mechanics. Materials. Material resistance. Structure Design and calculation. Agricultural constructions. Infrastructures and rural roads.

CEMCR3. Ability to know, understand and use the principles of: Agricultural mechanization. Agricultural engines and machines. Characteristics and design of machinery for agricultural facilities. Agricultural automatic.

CEMCR4. Ability to know, understand and use the principles of: Facilities engineering. Rural electrification. Irrigation and drainage technology. Hydraulic works and installations. Facilities for animal health and welfare.

## **Subject contents**

### **Temary**

#### **Block A. Characterization of the conditions of the physical, environmental, legal, developer, irrigation and socio-economic environment, etc. (Professor Josep Maria Villar and others)**

##### **A.1.- Climatic characteristics.**

1. General features and climatology of the area (Summary that must include monthly averages of rainfall, temperature, radiation and wind). Indicators of interest (Limitations, if any, for the implementation of certain

crops (both herbaceous and arboreal).

2. Identification of the main conditions and limitations for agricultural production (frost, wind, distribution and intensity of rain, squid, periods of drought, ETo)
3. Meteorological stations for the monitoring of the meteorological conditions in real time (Applications of interest according to the type of work to realize, geographic area, agricultural exploitation, etc ....)

## A.2.- Soil characterization:

1. Soil information available (characterization and interpretation work). How to take soil samples according to the purpose of the study.
2. Identification of the main conditions or limitations for agricultural production (salinity, soil depth, CRAD, texture and structure, pH, sodicity, organic matter, carbonates, stoniness, risk of erosion, drainage needs, ....)
3. Soil fertility (diagnosis of soil fertility, identification of properties that may affect agricultural production and the fertilization plan according to the production plan). Collection of complementary information (analysis of plants, commonly used fertilizers, dosage, time of application and form of application, ....)

## A.3.- Implications in production systems:

1. Interaction of the conditions of the environment in the technology of the production (work of the floor, management of the vegetal cover, defense against frosts, ...)
2. Resource management (water and nutrients). Irrigation programming (in irrigation systems). Estimation and probability of annual yields as a function of rainfall (for rainfed crops). Fertilization plans
3. Evaluation of resource efficiency

A.4.- Environmental aspects (Livestock manure plans, regulations for areas vulnerable to fertilization calculations, animal welfare regulations, chemicals and phytosanitary products to be used and compliance with application regulations, regulations, etc....)

1. Regulations and implementing provisions
2. Aspects to be taken into account and degree of compliance
3. Land-landscape relations (if applicable)
4. How to monitor the impact of agricultural activity on the environment.

## **Bloc B.- Estudi i elecció d'alternatives del pla productiu (Professors: Carlos Cantero, Luis F. Gosálvez i Lluís Martín)**

### B.1.- Elecció del pla productiu de conreus

1. Alternativa de cultius: Elecció del/s cultius
2. Elecció de rotació (si es el cas)
3. Descripció de la tecnologia de cultius aplicada al cultiu escollit: Descripció senzilla i segons model de fitxa que es lliurarà i explicarà i que inclourà (1) característiques del maneig del sòl (conreu); (2) característiques de la sembra i elecció del material vegetal; (3) programació de la fertilització; (4) càlcul de les necessitats hídriques del cultiu; (5) pla de control de males herbes, plagues i malalties; (6) Mètode i forma de recol·lecció i emmagatzemant del producte del cultiu.

### B.2.- Elecció del pla productiu ramader

1. Descripció de les alternatives
2. Elecció de l'alternativa
3. Descripció dels principals punts a seguir per al desenvolupament de l'alternativa triada: Material animal, cicle productiu, maneig, alimentació, sanitat i higiene, producte final.

### B.3.- Elecció del sistema de reg

## **Block B.- Study and choice of alternatives of the productive plan (Teachers: Carlos Cantero, Luis F. Gosálvez and Lluís Martín)**

### B.1.- Choice of the productive plan of crops

1. Alternative crops: Choice of crop (s)
2. Choice of rotation (if applicable)
3. Description of the crop technology applied to the chosen crop: Simple description and according to model of file that will deliver and explain and that will include (1) characteristics of the handle of the floor (crop); (2) characteristics of planting and choice of plant material; (3) fertilization scheduling; (4) calculation of crop water needs; (5) weed, pest and disease control plan; (6) Method and form of harvesting and storage of the crop product.

### B.2.- Choice of the livestock production plan

1. Description of the alternatives
2. Choice of alternative
3. Description of the main points to follow for the development of the chosen alternative: Animal material, production cycle, handling, food, health and hygiene, final product.

### B.3.- Choice of irrigation system

## **Block C.- Engineering**

### C.1.- Irrigation Engineering (Teacher: Lluís Cots)

1. Agronomic design and hydraulic design of the installation and the irrigation head
2. Choice of materials and equipment of the installation
3. Management of the installation
4. Plans of the irrigation installation and the irrigation head

### C.2.- Construction Engineering (Teachers: Álvaro Fernández and Lluís Puigdomènech)

1. Basic dimensions of ship according to needs
2. Dimensioning of foundations
3. Structural needs
4. Closure materials and insulation and waterproofing needs
5. Auxiliary works

### C.3.- Electrification Engineering (Professor Joan R. Rosell)

1. Dimension the low voltage installation.

2. Carry out the electrical calculation of the transformer to supply the low voltage installation.
3. Carry out the electrical calculation of the high voltage line that supplies the transformer.

C.4.- Other aspects of engineering to be considered according to the proposed project can be: roads and internal drainage network of land, systematization of land, choice of agricultural and livestock machinery, design of heating systems, ventilation, refrigeration and fire protection, automation of facilities, temporary planning of works, etc.

**Block D.- Financial and economic evaluation of the investment (Teacher: José Millan)**

1. Financial or private evaluation of the project
  - 1.1. Parameters characteristic of an investment.
  - 1.2. Profitability criteria (NPV, IRR and Payback).
  - 1.3. Sensitivity analysis.
2. Economic or social evaluation of the project: external benefits and costs.

**Practical activities**

**Guided activities (ACD)**

Once the case to be solved has been chosen and specified with the objectives of the work and prior acceptance of the same by the coordinating teacher of the subject, the teachers of the different areas involved in the case to be solved will attend to the students to guide them. and resolve any doubts that may arise in agreed tutoring schedules in order to achieve the objectives set at work

**Visits (VIS)**

Visit to companies and facilities similar to those that are the object of study according to the theme chosen by the students.

**Methodology**

**Learning activities**

Explanation and presentation of the subject in person by the coordinator and also by the other teachers on how to work on the different aspects of the project or case to be studied. The follow-up of the work will be done with directed activities or seminars of face-to-face or virtual tutorials depending on the needs that arise.

Type of activity	Description	Face-to-face activity Student		Non-contact activity Student		Total time	
		Goals	Hours	Student work	Hours	Hours	ECTS
<b>Master class</b>	Master class (Classroom. Small group)	Explanation of cases, methodology and sources of information	12	Study: Know, understand and synthesize knowledge	12	24	0,96



<b>Directed activity</b>	Student work	Orient the student in the work (in schedule of tutorials)	<b>41</b>	Student work	<b>60</b>	<b>101</b>	<b>4,04</b>
<b>Visits</b>	Visits	Contact with reality	<b>6</b>	Contrast reality with what you have learned	<b>6</b>	<b>12</b>	<b>0,48</b>
<b>Evaluation</b>	Presentation of the final document	Discuss and present the document in public	<b>1</b>	Synthesis of the work and preparation of the presentation	<b>12</b>	<b>13</b>	<b>0,52</b>
<b>Totals</b>			<b>60</b>		<b>90</b>	<b>150</b>	<b>6,0</b>

**Observations**

25 hours of total activity per ECTS credit have been considered.

**Development plan**

**Timing**

It will depend on the case chosen, but in a generic way you could have the following planning

Type of activity	Content	Contact hours
Theory	Subject presentation	2
Theory	Block A	2
Directed Activity	Block A	10
Theory	Block B1 and B2	1
Directed Activity	Block B1 and B2	4
Theory	Block B3 and B4	1
Directed Activity	Block B3 and B4	2
Theory	Bloc C1	2
Directed Activity	Bloc C1	6
Visit	1st Visit	2
Directed Activity	Block A and B	2
Theory	Block C2	1
Directed Activity	Block C2	6
Visit	2nd Visit	2
Theory	Block C3	1
Directed Activity	Block C3	3
Theory	Block C4	1
Directed Activity	Block C4	3

Directed Activity	Block B and C	3
Visit	3rd Visit	2
Theory	Block D	1
Directed Activity	Block D	2
Evaluation	Evaluation	1
<b>Totals</b>		<b>60</b>

## Evaluation

### Deadlines

Deadlines will be set for each part of the project so that it is done gradually throughout the semester. Failure to meet the deadlines will result in a negative assessment in the final grade.

### Activities

Type of activity	Evaluation Activity Procedure	Weight rating	
		Number	(%)
<b>Totes</b>	Continuous performance and monitoring of the work	<b>4</b>	<b>20</b>
<b>Totes</b>	Written presentation of the work	<b>1</b>	<b>50</b>
<b>Totes</b>	Oral presentation	<b>1</b>	<b>30</b>
<b>Total</b>			<b>100</b>

The oral presentation will be a session where the teachers involved will ask students orally about the different aspects of the project to see how far they have reached the knowledge of all parts of it. In the event that a student does not correctly defend the parts asked, he will have to repeat the defense in the call for retaking exams, even if the mark of the other parts exceeds 5 points.

### Observations

For the purposes of the final grade, in order to pass the subject it will be necessary to have obtained a mark of the set of the different activities equal or superior to 5 points and to have passed the part of the oral presentation satisfactorily, which is obligatory to do it together with the presentation of the working document.

## Bibliography

### Basic bibliography

Block A:

- Allen R.G.; Pereira, L.S.; Raes, D., Smith, M. 1998. *Crop evapotranspiration. Guidelines for computing crop water requirements*. FAO Irrigation and drainage paper n. 56. FAO Roma (Italia). 300 pp.
- Decret 136/2009, d'1 de setembre, d'aprovació del programa d'actuació aplicable a les zones vulnerables en relació amb la contaminació de nitrats que procedeixen de fonts agràries i de gestió de les dejeccions ramaderes.
- Martín de Santa Olalla F., López P., Galera A. (Coord.) 2005. *Agua y agronomía*. Ed. Mundi-Prensa. Universidad de Castilla-La Mancha.
- Normes tècniques de Producció integrada: [http://www.producciointegrada.cat/normes\\_tecnicas](http://www.producciointegrada.cat/normes_tecnicas)
- Villar J.M., Villar P. 2010. *Fertilidad de suelos y nutrición de plantas*. Versión 3.27. Quaderns DMACS núm. 30. 173 pp. (Pendiente del Depósito legal)

## Block B:

- Buxadé, C., 1995. Zootecnia. *Bases de producción animal*. 10 tomos. Mundiprensa. Madrid.
- Loomis R.S., Connor D.J. 1992. *Crop Ecology: Productivity and management in Agricultural Systems*. Cambridge.
- Maroto, J.V. 2003. *Horticultura Herbácea Especial*. Ed. Mundi-Prensa. 566 p
- Maroto, J.V. 2008. *Elementos de Horticultura General*. Ed. Mundi Prensa. 424 p
- Santiveri P., Cantero-Martínez C., Lloveras J. 1995. *Prácticas de Cultivos extensivos*. Plan 1993. UdL-ETSEA. Lleida. pp.106.
- Sisquella M., Lloveras J., Santiveri P., Cantero-Martínez C., 2004. *Técnicas de gestión ambiental en cultivos extensivos de regadío*. Proyecto TRAMA. Fundació Catalana de Cooperació. Lleida. ISBN. 84-688-7856-1.

## Block C1:

- Barragán, J. Monserrat, J. 2007. *Algunas notas para clases de Hidráulica y Riegos*. Universitat de Lleida.
- Pizarro, F. 1996. *Riegos localizados de alta frecuencia: goteo, microaspersión y exudación*. Mundi Prensa.
- Tarjuelo, J.M. 1995. *El riego por aspersión y su tecnología*. Mundi Prensa.
- Projectes o treballs finals de carrera depositats a la biblioteca de l'Escola Tècnica Superior d'Enginyeria Agrària de l'Universitat de Lleida que puguin servir com a referència segons el cas ha analitzar

## Block C2:

- Ministerio de vivienda, rev. 2006: *CTE*
- Ministerio de Fomento, 2008: *EHE-08*
- Manuals de bona pràctica (fabricants, gremis, col·legis, NTE, asseguradores)

## Block C3:

- Benilde Bueno, Reglamento Electrotécnico para Baja Tensión. Barcelona: Ed. Marcombo 2020.
- García Trascancos. 2003. *Instalaciones eléctricas en media y baja tensión*. Adaptado al nuevo RBT (BOE 2002). 4ª Edición Actualizada. Ed. Thomson-Paraninfo. Madrid. 392 pp.
- 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).
- Ministerio de Indústria, Comercio y Turismo. 1991. *Líneas eléctricas Aéreas de Alta Tensión*

## Block D:

- Romero, Carlos. 1998. *Evaluación financiera de inversiones agrarias*. Mundi-Prensa. Madrid.

## Complementary bibliography

### Block B:

- Cantero-Martínez C., Santiveri F., Lloveras J., Chocarro C. 2006. *Agronomy of Field Crops*. In Estany J. (ed.) *Agriculture and Agri-Food Production in perspective. Profile of the sector in Catalonia*. University of Lleida, Lleida, 2006. ISBN-84-8409-207-0. 42 pp.

- Doorenbos J.; Pruit WO. 1976. *Las necesidades de agua de los cultivos*. FAO. Roma 210 pp.
- Pujol M. 1983. *Les lleguminoses de grà*. EUITA. Barcelona. 32 pp.
- Pujol M. 1984. *Conceptes de morfologia i biologia de les graminees*. EUITA. Barcelona. 60 pp.
- Pujol M. 1984. *Els Cereals: Generalitats*. EUITA. Barcelona. 165 pp.
- Pujol M. 1998. *Gramíneas: Aplicaciones Agronómicas*. Ediciones UPC. Barcelona. 219 pp.
- Pujol M. 1998. *Cultius herbacis per a Indústries Agroalimentaries*. Ed. Romanyà Valls. Capellades. 253 pp.
- Sisquella M., Lloveras J., Alvaro J., Santiveri P., Cantero-Martinez C., 2004. *Técnicas de cultivo para la producción de maíz, trigo y alfalfa en los regadíos del valle del Ebro*. Proyecto TRAMA. Fundació Catalana de Cooperació. Lleida. ISBN. 84-688-7860-X.
- Wild A. 1973. *Russell's Soil Conditions and Plant Growth*. Longman Scientific and Technical. Harlow. 991 pp.
- Webs: <http://www.irta.es/>; <http://www.genvce.org/>; <http://www.nolaboreo.es/>; <http://www.aeac-sv.org/>; <http://www.ruralcat.net/>

## Block C3:

- Checa. 1988. *Líneas de transporte de energía*. Marcombo Boixareu.
- De Francisco, Castillo y Torres. 1993. *La Energía Eléctrica en la explotación Agraria y Forestal*. Ed. Mundi Prensa. Madrid. 397 pp.
- López y Guerrero. 1992 *Instalaciones Eléctricas para Proyectos y Obras*. Ed. Paraninfo.
- Ministerio de Ciencia y Tecnología. 2004. *Guía Técnica de aplicación del Reglamento Electrotécnico de Baja Tensión 2002*.
- Ministerio de Industria y Energía. 1990. *Reglamento sobre Centrales Eléctricas, Subestaciones y Centros de Transformación*.
- Ministerio de Industria, Comercio y Turismo. 1991. *Reglamento de verificaciones eléctricas*.
- Moreno y Cano. 2004. *Instalaciones eléctricas de baja tensión*. Ed. Thomson.

## Block D:

- Ceña, Felisa i Romero, Carlos (1989) *Evaluación económica y financiera de inversiones agrarias* [2ª ed.]. Mundi-Prensa, Madrid.
- Roura, Horacio i Cepeda, Horacio (1999). *Manual de identificación, formulación y evaluación de proyectos de desarrollo rural*. CEPAL Naciones Unidas. Santiago de Chile.  
[www.eclac.org/publicaciones/xml/9/6729/manual2.pdf](http://www.eclac.org/publicaciones/xml/9/6729/manual2.pdf)