



Universitat de Lleida

DEGREE CURRICULUM  
**CONTROL, CERTIFICATIONS  
AND AUDITING**

Coordination: MEDRANO MARTORELL, MARCO

Academic year 2021-22

## Subject's general information

<b>Subject name</b>	CONTROL, CERTIFICATIONS AND AUDITING			
<b>Code</b>	14527			
<b>Semester</b>	1st Q(SEMESTER) CONTINUED EVALUATION			
<b>Typology</b>	<b>Degree</b>	<b>Course</b>	<b>Character</b>	<b>Modality</b>
	Master's Degree in Industrial Engineering (M 2021)	2	COMPULSORY	Attendance-based
	Master's Degree in Industrial Engineering	2	COMPULSORY	Attendance-based
<b>Course number of credits (ECTS)</b>	6			
<b>Type of activity, credits, and groups</b>	<b>Activity type</b>	PRAULA		TEORIA
	<b>Number of credits</b>	3		3
	<b>Number of groups</b>	1		1
<b>Coordination</b>	MEDRANO MARTORELL, MARCO			
<b>Department</b>	COMPUTER SCIENCE AND INDUSTRIAL ENGINEERING			
<b>Teaching load distribution between lectures and independent student work</b>	60 h lecture (40%) 90 h autonomous (60%)			
<b>Important information on data processing</b>	Consult <a href="#">this link</a> for more information.			
<b>Language</b>	Catalan			
<b>Distribution of credits</b>	Josep Eras Vila (3) Josep Marín Vitalla (3)			

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
MARIN VITALLA, JOSE VICENTE	josevicente.marin@udl.cat	3	
MEDRANO MARTORELL, MARCO	marc.medrano@udl.cat	3	

## Subject's extra information

Today an industrial engineer should be able to do checks, audits and certifications . This is a subject taught in the second year of the first semester of the master's degree in industrial engineering and its content is geared to building controls, energy certification of buildings and facilities and to perform audits in works facilities, buildings and industries. It is a subject that has a high content of norms and regulations but also practical works and installations, tours and seminars given by leading experts in the sector .

This subject is important for students to go over how to balance energy and matter because they are essential when doing audits .

It is **COMPULSORY** that the students bring the following elements of individual protection (EPI) to the practices at the laboratory.

- Blue or white laboratory gown from UdL (unisex)
- Protection glasses
- Mechanical protection gloves

They can be purchased through the shop Údels of the UdL:

C/ Jaume II, 67 baixos  
Centre the Cultures i Cooperació Transfronterera

<http://www.publicacions.udl.cat/>

The use of other elements of protection (for example caps, masks, gloves of chemical or electrical risk, etc.) will depend on the type of practice to be done. In that case, the teacher will inform of the necessity of specific EPI.

Not bringing the EPI's described or not fulfilling the norms of general security that are detailed below imply that the student can not access to the laboratories or have to go out of them. The no realisation of the practices for this reason imply the **consequences in the evaluation** of the subject that are described in this course guide.

### GENERAL NORMS OF SECURITY IN LABORATORY PRACTICES

- Keep the place of realisation of the practices clean and tidy. The table of work has to be free from backpacks, folders, coats...
- No short trousers or short skirts are allowed in the laboratory.
- Closed and covered footwear is compulsory in the laboratory.
- Long hair needs to be tied.
- Keep the laboratoy gown laced in order to be protected from spills of chemicals.

- Bangles, pendants or wide sleeves are not allowed as they can be trapped.
- Avoid the use of contact lenses, since the effect of the chemical products is much bigger if they enter between the contact lense and the cornea. Protection over-glasses can be purchased.
- No food or drink is allowed in the laboratory.
- It is forbidden to smoke in the laboratories.
- Wash your hands whenever you have contact with a chemical product and before going out of the laboratory.
- Follow the instructions of the teacher and of the laboratory technicians and ask for any doubt on security.

For further information, you can check the following document of the *Servei de Prevenció de Riscos Laborals de la UdL*: <http://www.sprl.udl.cat/alumnes/index.html>

## Learning objectives

### GENERAL PURPOSE OF THE SUBJECT

To **provide** students with the **knowledge** and **techniques**, **tools**, **skills** and **abilities** needed to perform effectively **controls, certifications and audits**.

The achievement of this overall objective is based on :

- To **transmit** to specialists and non-specialist audiences the knowledge acquired in the course.
- To **use engineering tools** to conceive, design, implement solutions and projects.
- To prove to **have sufficient knowledge** for this subject, both scientific and technological.
- To **have ability to carry out controls, certifications and audits**.
- To **have ability to solve complex problems** related to the topic of the course

## Competences

### Basic Competences according to Reial decret 861/2010 and Ordre CIN/311/2009:

- **CB1**. To possess and understand knowledge that provides a base or opportunity to be original in the development and/or application of ideas, often in a research context.
- **CB3**. To be able to integrate knowledge and face complexity in order to make judgements from an information that, being incomplete or limited, it would include issues of social and ethical responsibilities directly related to the application of this knowledge and judgements.
- **CB4**. To be able to communicate conclusions –and knowledge and reasons that support them– to either specialized or not specialised publics in a clear way and without ambiguities.
- **CG13**. Knowledge, understanding and capacity to apply the necessary legislation in order to practice the profession of Industrial Engineer.

### General Competences according to Ordre CIN/311/2009 and EPS criteria:

- **CG2**. Capacity to consider the socioeconomic context as well as the sustainability criteria in the engineering solutions.

### Specific Competences according to Ordre CIN/311/2009:

- **CE14**. Knowledge and skills to carry out verification and control of installations, processes and products.
- **CE15**. Knowledge and skills to carry out certifications, audits, verifications, essays and reports.

### Transversal Competences:

**CT5**. Apply the genre perspective to the tasks of the professional field.

## Subject contents

### **Block I: CONTROL AND AUDITS**

#### **Theory Program**

Chapter 1. Introduction: energy and energy efficiency

Chapter 2.- Control and audits

2.1. Introduction

2.2. Definition: energetic audit

2.3. Objectives

2.4. Type of study and energetic audits

2.5. Audit team: who is in charge of an audit?

2.6. Legislation

2.7. Steps in an energetic audit

Chapter 3: Building energy analysis

### **Block II: CERTIFICATIONS**

#### **Theory Program**

Chapter 1. Certifications

1.1. Introduction

1.2. Situation in Catalonia, Spain and Europe

Chapter 2. Energetic certification in buildings

2.1. Energy and edification

2.2. Legislation

2.3. Energetic certification in buildings

2.4. Certification process in Catalonia

2.5. Software

Chapter 3. Other types of certifications in buildings: environmental

## Methodology

The activities will be divided into three parts that complement each other: lectures, visits and seminars and problem solving.

- **Lectures:** In the lectures expose the contents of the subject orally by the teacher without the active participation of students.
- **Visits and seminars:** Practical sessions where students will play an active role: individual or in-group activities.
- **Problem solving:** In problem solving sessions teachers present a complex issue that students should solve, whether working individually or in teams .

## Development plan

Week	Methodology	Topic	Lecture hours	Autonomous work hours	Professor
1	Lecture	Presentation and introduction	2	3	Marc Medrano J. V. Marín
1	Lecture	BLOCK I. Chapter 1. Introduction: energy and energy efficiency	2	3	J. V. Marín
2-5	Lecture Problems resolution	BLOCK I. Chapter 2. Control and audits	12	18	J. V. Marín
6-8	Lecture Problems resolution	BLOCK I. Chapter 3. Analysis of building energy data	12	18	Marc Medrano
9		Evaluation. Written test.	2	3	Marc Medrano J. V. Marín
10-12	Lecture Problems resolution	BLOCK I. Chapter 3. . Analysis of building energy data	12	18	Marc Medrano
12-13	Lecture Problems resolution	BLOCK II. Chapter 1. Certifications	6	9	J. V. Marín
14-15	Lecture Problems resolution	BLOCK II. Chapter 2. Energetic Certifications in buildings	10	15	J. V. Marín

15	Lecture Problems resolution	BLOCK II. Chapter 3. Other certifications	2	3	J. V. Marín
16-19		Evaluation Written test Recovery			Marc Medrano J. V. Marín

## Evaluation

Evaluation activities	%	Dates	C/V (1)	I/G (2)	Observations
PA1: Written and oral report about visit 1	25	Week 4	C	G	
PA2: Written and oral report about visit 2	25	Week 15	C	I	
PA3: Written report of buiding energy analysis	20	Week 15	C	G	
PA4: Oral presentation of buiding energy analysis	20	Week 10	C	I	
PA5: Class exercises	10	Along the course	C	G	
PA6: Recovery exam		Week 19	C	I	

1. Compulsory/Voluntary
2. Individual/Groups

## Bibliography

### Basic bibliography

#### Energy audits

-“Procedimientos para la determinación del rendimiento energético de plantas enfriadoras de agua y equipos autónomos de tratamiento de aire”. Colección Guías Técnicas de Ahorro y Eficiencia Energética en Climatización, 2. Ed. IDAE, 2007. . (Versión pdf en la web del IDAE).

-“Procedimientos de inspección periódica de eficiencia energética para calderas”. Colección Guías Técnicas de Ahorro y Eficiencia Energética en Climatización, 5. Ed. IDAE, 2007. . (Versión pdf en la web del IDAE).

-“Contabilización de consumos”. Colección Guías Técnicas de Ahorro y Eficiencia Energética en Climatización, 6. Ed. IDAE, 2007. . (Versión pdf en la web del IDAE).

-“Estalvi i eficiència energètica en Edificis Públics. Guia de bones pràctiques” (Versión pdf en la web del ICAEN)

-“Eficiencia Energética en Edificios. Certificación i Auditorias Energéticas” Ed. Parainfo

-“Ahorro y Eficiencia Energética en Instalaciones Ganaderas”. Ed. IDAE, 2005 (Versión pdf en la web del IDAE).

-“Protocolo de Auditoría Energética de las Instalaciones de Alumbrado Público Exterior”. Ed. IDAE, 2008 (Versión pdf en la web del IDAE).

-“Aislamiento en edificios: Guías Técnicas para la Rehabilitación de la Envolvente Térmica de los Edificios”. Ed. IDAE, 2007. . (Versión pdf en la web del IDAE).

-“Avaluació energètica d'edificis”. Edicions UPC

-Francisco Javier Rey Martínez, Eloy Velasco Gómez, "Eficiencia energética en edificios, Certificación y auditorías energéticas", Thomson, ISBN: 84-9732-419-6

### **Energy certifications**

-IDAE

-ICAEN

-Directiva 2002/91/CE (Europa) i Directiva 2010/31/UE

—CTE, RITE, Real Decret RD47/2007, Projecte real decret RD2012

—Decret d'ecoeficiència RD 21/2006

—ISO 50001