Universitat de Lleida

DEGREE CURRICULUM

ELECTRICAL INSTALLATIONS AND HVAC SYSTEMS

Coordination: CABEZA FABRA, LUISA FERNANDA

Academic year 2019-20

Subject's general information

<table>
<tr><td>Subject name</td><td>ELECTRICAL INSTALLATIONS AND HVAC SYSTEMS</td></tr>
<tr><td>Code</td><td>14526</td></tr>
<tr><td>Semester</td><td>1st Q(SEMESTER) CONTINUED EVALUATION</td></tr>
<tr><td>Typology</td><td>
<table>
<tr><th>Degree</th><th>Course</th><th>Character</th><th>Modality</th></tr>
<tr><td>Master's Degree in Industrial Engineering</td><td>1</td><td>COMPULSORY</td><td>Attendance-based</td></tr>
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<tr><td>Course number of credits (ECTS)</td><td>6</td></tr>
<tr><td>Type of activity, credits, and groups</td><td>
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<tr><th>Activity type</th><th>PRAULA</th><th>TEORIA</th></tr>
<tr><td>Number of credits</td><td>3</td><td>3</td></tr>
<tr><td>Number of groups</td><td>1</td><td>1</td></tr>
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<tr><td>Coordination</td><td>CABEZA FABRA, LUISA FERNANDA</td></tr>
<tr><td>Department</td><td>COMPUTER SCIENCE AND INDUSTRIAL ENGINEERING</td></tr>
<tr><td>Teaching load distribution between lectures and independent student work</td><td>60 h of classroom work (40%)
90 h of independent student work (60%)</td></tr>
<tr><td>Important information on data processing</td><td>Consult this link for more information.</td></tr>
<tr><td>Language</td><td>Catalan/Spanish</td></tr>
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Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
CABEZA FABRA, LUISA FERNANDA	luisaf.cabeza@udl.cat	0	
MASIP ORONICH, JORDI	jordi.masip@udl.cat	2,4	
SOLÉ CUTRONA, CRISTIAN	cristian.sole@udl.cat	3,6	

Subject's extra information

The subject of electricity and HVAC systems addresses issues related to the different facilities that can be found today in both the domestic and industrial sector, covering from water supply facilities to sewage systems, HVAC systems, fire protection facilities and design and low voltage electrical installations.

To address the different contents, prior knowledge of fluid mechanics, thermal engineering, basics of electricity is required, as well as be familiar with the use of technical regulations.

Learning objectives

To provide students with the knowledge, systems and technologies for the various facilities studied in order to be able to design and implement them following efficient and economical criteria as well as the existing regulations:

- To be able to pre-dimension water supply installations, HVAC systems, drainage and electricity, while applying the theoretical basis of different installations.
- To be able to realize about errors of magnitude and if the results are logical and coherent or if the errors are because of a mathematical mistake
- To understand the distribution and elements of different facilities.
- To implement properly the technics for technical drawings of services in order to be able to build and construct accordingly as planned.
- To apply the regulations to the installations, as well as the different existing processes to verify its operation before its commissioning.
- To know about the current regulations of the installations in the way of its real implementation.

Competences

Basic competences set in Royal decree 861/2010 and Order 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.
- **CB2.** To be able to apply the knowledge gained and to solve problems in new environments in wider contexts (or multidisciplinary) related with the area of study.
- **CB5.** To possess the skills to continue learning self - directed and freelance.

General competences set in ORDEN CIN/311/2009 and EPS criteria

- **CG1.** Capacity of planning and organizing the personal work.
- **CG2.** Capacity to consider the socioeconomic context as well as the sustainability criteria in the engineering solutions.
- **CG3.** Capacity to convey information, ideas, problems and solutions both to a specialised and no specialised public.
- **CG4.** Capacity to conceive, design and implement projects and/or provide new solutions, using the tools that the engineering offers.
- **CG6.** To have suitable knowledge of the scientific and technological issues of: mathematical, analytical and numerical methods in engineering, electrical engineering, energetic engineering, chemical engineering, mechanical engineering, mechanics of continuous means, industrial electronics, automation, manufacture, material, quantitative methods of management, industrial computing, urbanism, infrastructures, etc.
- **CG7.** To project, calculate and design products, processes, installations and plants.
- **CG9.** To do research, development and innovation in products, processes and methods.
- **CG11.** To manage both technically and economically projects, installations, plants, companies and technological centres.

Specific competences set in ORDEN CIN/311/2009

- **CE12.** Knowledge and capacities to project and design electrical and fluid installations, illumination, heating, ventilation and air conditioning, energetic efficiency, acoustic, communications, domotics, and intelligent buildings and security installations.

Cross - disciplinary competences

- **CT1.** Appropriate skills in oral and written language.
- **CT2.** Command of a foreign language.

Subject contents

Topic 1. Fire-protection

1. Regulations
2. Introduction
3. Symbology
4. Fire detection elements
5. Hydraulic installations
6. Gas systems
7. Foam systems

Topic 2. HVAC

1. Introduction
2. HVAC systems
3. Air distribution
4. Energy savings
5. Heat generation
6. Cold generation
7. Energy recovery
8. Energy saving with the use of renewable energy

Topic 3. Water supply

1. Regulations

2. Urban distribution networks
3. Suply
4. General installatiion
5. Indoor installation
6. Materials within the indoor installation
7. Symbology
8. Domestic hot water installation
9. Design and assembly
10. Sizing

Topic 4. Sewaje

1. Regulations
2. Evacuation and draining installations
3. Main parts of the indoor evacuation network
4. Symbology
5. Indoor networks distribution systems
6. Sizing

Topic 5. Electricity

1. Fundamental concepts on electricity
2. Regulations
3. Electric suply
4. Linking installations
5. Indoor or reception installations
6. Installation systems
7. Protections for circuits and receptors
8. Person protection
9. Grounding installation

Methodology

The methodological axes of the course will be divided into:

- Master class: In master classes the contents are presented orally by the lecturer with no active participation of the students.
- Problems resolution: In this activity, the lecturer presents a complex question that the students must solve, either individually or in group.
- Team work: Learning activity that must be developed in collaboration with the other members of a team.
- Visits: activity of a group of students, led by teachers, consisting in visiting a certain place to obtain a real feedback that enhances the learning process
- Laboratory: It allows to apply and configure, at a practical level, the theoretical knowledge of a specific area in a defined context.

Development plan

Week	Methodology	Topic	Classroom hours	independent student work	Professor/lecturer
1-4	Master class Problem resolution Laboratory Team work Visit	Subject presentation Topic 1. Fire-protection	12	18	Cristian Solé Jordi Masip

5-6	Master class Problem resolution Laboratory Team work	Topic 2. HVAC	12	18	Cristian Solé Jordi Masip
7-8	Master class Problem resolution Laboratory Team work	Topic 3. Water supply	8	12	Cristian Solé Jordi Masip
9		Evaluation			Cristian Solé Jordi Masip
10-12	Master class Problem resolution Laboratory Team work Visits	Topic 4. Sewage	12	18	Cristian Solé Jordi Masip
13-15	Master class Problem resolution Laboratory Team work Visits	Topic 5. Electricity	12	18	Cristian Solé Jordi Masip
16-19		Evaluation			Cristian Solé Jordi Masip

Evaluation

Evaluation activity	%	Dates	C/V (1)	I/G(2)	Observations
Visits reports	10	To agree	C	G	To consider the mark for the average, it is necessary to have a minimum of 5 (out of 10)
1st Mid-term Theory Exam	20	Week 8	C	I	To consider the mark for the average, it is necessary to have a minimum of 4 (out of 10)
Presentation first part of the assignment	5	Week 8	C	G	To consider the mark for the average, it is necessary to have a minimum of 5 (out of 10)

Delivery of first part of the assignment	5	Week 8	C	G	To consider the mark for the average, it is necessary to have a minimum of 5 (out of 10)
2nd Theory Exam	20	Week 16 and 17	C	I	To consider the mark for the average, it is necessary to have a minimum of 4 (out of 10)
Presentation second part of the assignment	15	Week 16 and 17	C	G	To consider the mark for the average, it is necessary to have a minimum of 5 (out of 10)
Delivery of second part of the assignment	10	Week 16 and 17	C	G	To consider the mark for the average, it is necessary to have a minimum of 5 (out of 10)
Cype (final)	15	Week 16 and 17	C	G	To consider the mark for the average, it is necessary to have a minimum of 5 (out of 10)
Presentation of the assignment Final report of the assignment	90	Week 19	C	G	The assignment can be resubmitted

Bibliography

Recommended Bibliography

- Arizmendi Barnes, Luis Jesús (2003): “Cálculo y Normativa Básica de las Instalaciones en los edificios”. Tomo I y II. Editorial EUNSA.
- Huidobro, José M. Manual de Telecomunicaciones. Ed. Ra-Ma
- Lagunas Marqués, Ángel – Instalaciones eléctricas de baja tensión en edificios de viviendas- Ed.Paraninfo – Madrid – 2003
- Martín, F.INSTALACIONES ELÉCTRICAS. Fundación Escuela de la Edificación.
- Vázquez Moreno, Javier. Herranz Aguilar, Juan Carlos. “Manual práctico de instalaciones en edificación. Tomo I. Instalaciones hidráulicas”. Editorial LITEAM. 1ª edición. Año 2001. ISBN: 84-95596-05-9R
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- Vázquez Moreno, Javier. Herranz Aguilar, Juan Carlos. “Manual práctico de instalaciones en edificación. Tomo III. Instalaciones eléctricas.” Editorial LITEAM. 1ª edición. Año 2001. ISBN: 84-95596-04-0