Course guides
320133 - CDLEAT - Calculus and Design of High Voltage Power Lines

Unit in charge: Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 709 - DEE - Department of Electrical Engineering.
Degree: BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Optional subject).
Academic year: 2021  ECTS Credits: 6.0  Languages: Catalan, Spanish

LECTURER
Coordinating lecturer: Ricard Horta Bernús
Others: Santiago Bogarra Rodriguez

PRIOR SKILLS
It is highly recommended to have passed the subject of Electrical Machines I

DEGREE COMPETENCES TO WHICH THE SUBJECT CONtributes
Specific:
CE29. (ENG) ELE: Coneixements i capacitats per aprofundir en tecnologies específiques de l’àmbit.

TEACHING METHODOLOGY
· Sessions of theoretical content.
· Sessions of practical work.
· Independent work and study exercises and case studies.
· Preparation and evaluated in group activities.
The professor will introduce the theoretical foundations of the subject, concepts, and methods illustrating them with appropriate examples to facilitate their understanding.
There will be 4 types of working sessions:
a) session that the teacher guides students in data analysis and problem solving using techniques, concepts and theoretical results.
b) Sessions of presentations made by the student group
c) Examination Session
Students will have all documents at digital campus: theoretical presentations made by the professor, solved exercises...
Students must study independently to assimilate the concepts, solving exercises
Students prepare to work in groups of five publicly presented in sessions of application.

LEARNING OBJECTIVES OF THE SUBJECT
It introduces the student to the principles of calculating mechanical and electrical parameters required to the design of aerial or subterranean electric lines.
To know the necessary tools to perform the correct sizing of conductors and its mechanical support.
Being able to do a project. Application of specific rules and regulations. Understand and be aware of the environmental and social impacts of these infrastructures. Using commercial catalogs.
### STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
<tr>
<td>Hours medium group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
<tr>
<td>Self study</td>
<td>90,0</td>
<td>60.00</td>
</tr>
</tbody>
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**Total learning time:** 150 h

### CONTENTS

**TOPIC 1: Electrical dimensions of a high voltage line**

**Description:**
- Introduction
- Calculation of physical and electrical constants
- Impact drivers crown
- Propagation equations
- Vector Graphics
- Method of electricity moment
- Insulation level
- Distances up and crossovers
- Ground
- Regulation of high voltage power lines: electric calculation

**Related activities:**
- Establish calculation of the conductors sections to carry out the criteria of optimized design.
- Be able to select conductors and their spatial distribution design.
- Be able to measure the ground
- Become familiar with applicable regulations

**Full-or-part-time:** 52h 30m

Theory classes: 21h
Self study : 31h 30m
TOPIC 2: Mechanical dimensions of an overhead power line

Description:
- Regulation
- Project
- Conductors and ground wires
- Loads and overloads
- Distances between elements and surfaces
- Supports
- Foundations
- Isolators
- Conductor support hardware
- Calculations
- Regulation of high voltage power lines: mechanical calculation

Related activities:
- To know the mechanical calculation methods for conductors, isolators and supports in order to carry out the criteria of optimized design.
- Be able to select conductors, insulators and supports.
- Become familiar with applicable regulations

Full-or-part-time: 37h 30m
Theory classes: 15h
Self study: 22h 30m

TOPIC 3: Dimensions of a subterranean high voltage line

Description:
- Calculation of conductors
- Ditches and pipes
- Ground

Related activities:
- To know the mechanical calculation methods for conductors sections in order to carry out the criteria of optimized design.
- Be able to select conductors and their spatial distribution.
- Be able to measure the ground.

Full-or-part-time: 37h 30m
Theory classes: 15h
Self study: 22h 30m
### TOPIC 4: Structure of power high voltage line project

**Description:**
- Regulation of high voltage power lines
- Report
- Calculations
- Specification
- Budget
- Plans
- Health and safety study
- Instructions for use and maintenance
- User scrapping

**Related activities:**
Become familiar with applicable regulations

**Full-or-part-time:** 3h
Theory classes: 2h
Self study: 1h

### TOPIC 5: Climate Change on global governance

**Description:**
- Impacts on flora (forests)
- Impacts on wildlife (birds)
- Impacts on people (C.E.Ms)
- Other impacts

**Related activities:**
- To know the different social and environmental impacts that may occur in the construction of this kind of infrastructure.
- Be aware of the environmental and social implications of a proposed power line
- Take personal opinion

**Full-or-part-time:** 7h 30m
Theory classes: 5h
Self study: 2h 30m

### GRADING SYSTEM

- Exam 1: 20%
- Exam 2: 20%
- Exam 3: 20%
- Exam 4: 20%
- Delivery 1: 5%
- Delivery 2: 5%
- Delivery 3: 5%
- Delivery 4: 5%
BIBLIOGRAPHY

Basic:

Complementary:
- Ras Oliva, E. Teoría de líneas eléctricas: de potencia, de comunicación, para transmisión en continua. 2a ed. Barcelona: UPC: Marombo, 1985-.