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

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>
</table>
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

**Specific objectives:**
- Introduce the methods of calculation and electrical design of a high voltage line
- 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

**Related activities:**
- Master classes
- Solving exercises
- Realization of projects

**Full-or-part-time:** 56h 30m
Theory classes: 10h
Practical classes: 10h
Self study: 36h 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

**Specific objectives:**
- Introduce the methods of calculation and mechanical design of a high voltage line
- 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

**Related activities:**
- Master classes
- Solving exercises
- Realization of projects

**Full-or-part-time:** 47h 30m
- Theory classes: 10h
- Practical classes: 10h
- Self study: 27h 30m

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# TOPIC 3: Dimensions of a subterranean high voltage line

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

**Specific objectives:**
- Introduce the methods of electrical and mechanical calculation of a high voltage underground line
- 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.

**Related activities:**
- Master classes
- Solving exercises
- Realization of projects

**Full-or-part-time:** 34h 30m
- Theory classes: 6h
- Practical classes: 6h
- 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

**Specific objectives:**
- To make known the contents of the regulations applicable to high voltage power lines
- Become familiar with applicable regulations

**Related activities:**
- Master classes
- Solving exercises
- Realization of projects

**Full-or-part-time:** 3h
- Theory classes: 1h
- Practical classes: 1h
- 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

**Specific objectives:**
- To raise awareness of the problems associated with infrastructures related to high voltage power lines
- 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

**Related activities:**
- Master classes
- Solving exercises
- Realization of projects

**Full-or-part-time:** 8h 30m
- Theory classes: 3h
- Practical classes: 3h
- 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: Marcombo, 1985-.