



Course guide

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

Last modified: 19/04/2023

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: 2023 **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

Type	Hours	Percentage
Hours medium group	30,0	20.00
Self study	90,0	60.00
Hours large group	30,0	20.00



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

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:

- Horta Bernús, Ricard ; Candela García, José Ignacio. Teoria, càlcul i disseny de línies elèctriques [on line]. Barcelona. Barcelona: Edicions UPC, 2001 [Consultation: 06/05/2020]. Available on: <http://hdl.handle.net/2099.3/36217>. ISBN 8483014629.
- Tora Galván, J. L. Transporte de la energía eléctrica: líneas aéreas a M.A.T. y C.A. Madrid: Universidad Pontificia de Comillas, 1997. ISBN 8489708193.
- Simón Comín, P. [et al.]. Cálculo y diseño de líneas eléctricas de alta tensión: aplicación al Reglamento de Líneas de Alta Tensión (RLAT) : Real Decreto 223/2008 de 15 de febrero. Madrid: Garceta, 2011. ISBN 9788492812868.

Complementary:

- Ras Oliva, E. Teoría de líneas eléctricas: de potencia, de comunicación, para transmisión en continua. 2a ed. Barcelona: UPC: Marcombo, 1985-.
- Cortés Cherta, M. Curso de aparamenta eléctrica. Barcelona: Merlin Guerin, 1990.