Last update: 23-04-2019

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

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 709 - EE - Department of Electrical Engineering
Academic year: 2019
Degree: BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
ECTS credits: 6 Teaching languages: Catalan, Spanish

Teaching staff

Coordinator: Ricard Horta Bernús

Others: Santiago Bogarra Rodriguez

Prior skills

Students may have passed the course Transport of Electric Power

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.

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Study load

Total learning time: 150h	Hours large group:	30h	20.00%
	Hours medium group:	30h	20.00%
	Hours small group:	0h	0.00%
	Guided activities:	0h	0.00%
	Self study:	90h	60.00%

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Content

TOPIC 1: Electrical dimensions of a high voltage line

Learning time: 52h 30m

Theory classes: 21h
Self study : 31h 30m

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

TOPIC 2: Mechanical dimensions of an overhead power line

Learning time: 37h 30m

Theory classes: 15h
Self study : 22h 30m

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

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TOPIC 3: Dimensions of a subterranean high voltage line	Learning time: 37h 30m Theory classes: 15h Self study : 22h 30m

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.

TOPIC 4: Structure of power high voltage line project	Learning time: 3h Theory classes: 2h Self study : 1h

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

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TOPIC 5: Climate Change on global governance	Learning time: 7h 30m Theory classes: 5h Self study : 2h 30m

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

Qualification 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, R.; Candela, J. I. Teoria, càlcul i disseny de línies elèctriques [on line]. Barcelona. Barcelona: Edicions UPC, 2001 [Consultation: 11/01/2016]. 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.