High voltage power lines and substations

Academic Year: (2023 / 2024) **Review date: 26/06/2023 12:03:57**

Department assigned to the subject: Electrical Engineering Department

Coordinating teacher: CASTRONUOVO , EDGARDO DANIEL

Type: Compulsory ECTS Credits : 6.0

Year : 3 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Electrical power engineering fundamentals.

LEARNING OUTCOMES

CB1. Students have demonstrated possession and understanding of knowledge in an area of study that builds on the foundation of general secondary education, and is usually at a level that, while relying on advanced textbooks, also includes some aspects that involve knowledge from the cutting edge of their field of study.
CB2. Students are able to apply their knowledge to their work or vocation in a professional manner and possess the competences usually demonstrated through the development and defence of arguments and problem solving within their field of study.
COCIN1. Ability to draft, sign and develop projects in the area of industrial engineering for construction, renovation, repair, preservation, demolition, manufacture, installation, assembly or operation of: structures, mechanical equipment, energy installations, electrical and electronic installations, industrial plants and installations and automation and manufacturing processes.
COCIN4. Ability to resolve problems with initiative, decision-making, creativity, and critical reasoning skills and to communicate and transmit knowledge, skills and abilities in the Industrial Engineering field.
COCIN5. Knowledge to perform measurements, calculations, assessments, appraisals, surveys, studies, reports, work plans and other similar jobs.
COCIN6. Ability to deal with mandatory specifications, regulations and norms.
CEP1. Capacity to design a system, component or process in the area of electrical engineering in compliance with required specifications.
ECRT4. Capacity for calculation and design of high voltage electrical installations.
ECRT5. Capacity for calculation and design of electrical power lines and electric energy transport.

By the end of this content area, students will be able to have:
RA1.3. Coherent knowledge of the branch of electrical engineering including some at the forefront of their branch in electric power facilities.
RA2.1. The ability to apply their knowledge and understanding to identify, formulate and solve problems of electric power facilities using established methods.
RA2.2. The ability to apply their knowledge and understanding to analyse engineering products, processes and methods.
RA3.1. The ability to apply their knowledge and understanding to develop and realise designs to meet defined and specified requirements.
RA3.2. An understanding of design methodologies, and an ability to use them.
RA4.1. The ability to conduct searches of literature, and to use data bases and other sources of information.
RA4.2. The ability to design and conduct appropriate experiments, interpret the data and draw conclusions.
RA5.1. The ability to select and use appropriate equipment, tools and methods in electric power facilities.
RA5.3. An understanding of applicable techniques and methods in electric power facilities, and of their limitations.
RA5.4. An awareness of the non-technical implications of engineering practice.
RA6.3. Demonstrate awareness of the health, safety and legal issues and responsibilities of engineering practice, the impact of engineering solutions in a societal and environmental context, and commit to

professional ethics, responsibilities and norms of engineering practice.

OBJECTIVES

1. Ability to complete a power line project, according to the Spanish regulations.
2. Ability to represent and operate a high voltage power line.
3. Basic knowledge of the switchgear used in electric substations.
4. Ability to use technical documents related to power systems such as regulations and standards.

DESCRIPTION OF CONTENTS: PROGRAMME

During the course, the following topics will be developed:

1. Naked conductors.
2. Electric parameters in power lines.
3. Power line models.
4. Propagation of electromagnetic waves in power lines.
5. Thermal limit.
6. Insulators in overhead lines.
7. Corona effect.
8. Sagging.
9. Pylons and electric distances.
10. Earthing.
11. High Voltage DC lines.
12. Live works.
13. Classification of switchgear.
14. Configuration of substations.
15. Substation planes.

LEARNING ACTIVITIES AND METHODOLOGY

- Master classes.
- Resolution of numerical examples in the classroom.
- Laboratory lessons.

ASSESSMENT SYSTEM

% end-of-term-examination/test:	0
% of continuous assessment (assigments, laboratory, practicals…):	100

ORDINARY CALL:
Continuous evaluation:
- Questions and exercises in classroom

CONVOCATORIA EXTRAORDINARIA:
Final Exam

Note: Laboratories are mandatories to approve the subject.

BASIC BIBLIOGRAPHY

- Bacigalupe Camarero, Fernando Líneas aéreas de media y baja tensión : cálculo mecánico, Paraninfo.

- Checa L.M. Líneas de transporte de energía, Marcombo Boixareu Editores, 1988

- Ministerio de Industria, Turismo y Comercio Reglamento sobre condiciones técnicas y garantías de seguridad en líneas de alta tensión : Real Decreto 223/2008, de 15 de febrero. BOE, BOE.

- Moreno Clemente, Julián Cálculo de líneas eléctricas aéreas de alta tensión, Moreno, J..

- Pascual Simón, Fernando Garnacho, Jorge Moreno, Alberto González Cálculo y diseño de líneas eléctricas de alta tensión, Garceta, 2011

- Tora Galván J.L. Transporte de la Energía Eléctrica, Universidad Pontificia de Comillas, 1997