

Academic Year/course: 2021/22

29627 - Power lines

Syllabus Information

Academic Year: 2021/22

Subject: 29627 - Power lines

Faculty / School: 110 - Escuela de Ingeniería y Arquitectura

Degree: 430 - Bachelor's Degree in Electrical Engineering

ECTS: 6.0

Year: 3

Semester: Second semester

Subject Type: Compulsory

Module:

1. General information

1.1. Aims of the course

The subject is aimed at acquiring knowledge about the operation and calculation of overhead high voltage and underground power lines.

For this, the following objectives must be achieved:

To have knowledge about:

- Power electrical systems
- Power lines
- Constituent elements of high voltage power lines
- Overvoltage and insulation coordination
- Power line models
- Environmental impact associated with power lines

And additional knowledge about:

- Select and calculate constituent elements of power lines
- Obtain the characteristic parameters of the power lines
- Solve problems regarding different equivalent models of power lines
- Calculate the earthing of power lines
- Interpret the specifications regarding legislation on power lines
- Interpret and select the specific switchgear from technical documentation
- Calculate the traction of the conductors, supports and switchgear of an overhead transmission and distribution power line
- Transmit the criteria and solutions for the design and calculation of power lines
- Apply environmental legislation in order to minimize the impact of the designed facilities.

1.2. Context and importance of this course in the degree

The subject of *Power Lines* is part of the module *Electrical power systems* and it is taught in the second semester of the third year.

To take it, solid knowledge of Mathematics is required, as well as the Fundamentals developed in Electrical Engineering, of the first year and Circuit Analysis of the second year. They are also necessary basic knowledge of Mechanics and Strength of Materials.

Power lines presents important learning results to take the subject Electrical power systems.

1.3. Recommendations to take this course

It is recommended to have passed the subjects of Physics II, Fundamentals of Electrical Engineering, Circuit Analysis, Mechanics and Material resistance. It must also need the support of mathematical analysis acquired in the subject of Mathematics.

Continuous study and work, from the first day of the term, are essential to overcome with the best performance the subject. It is important to solve any doubts that may arise as soon as possible, for which the student has the assistance of the teacher, both during classes and in the hours of tutorials intended for it.

2. Learning goals

3. Assessment (1st and 2nd call)

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The learning process that is designed for this subject is based on the following:

The learning process will involve the following: theory classes, problem-solving classes, practical activities in the laboratory and field, and cooperative problem-solving activities. The fundamentals of the electrical and mechanical design of overhead and underground power lines will be presented, illustrated with practical examples. In the problem-solving classes, both individual and teamwork will be addressed by the lecturers. Laboratory practice sessions consist of three hours of both lecturing and practicing in small groups, including visits to facilities and field measurement.

4.2. Learning tasks

The program that the student is offered to help you achieve the expected results includes the following activities

Lectures (30 in-class sessions of 50 minutes). Sessions where the lecturer explains the concepts underlying overhead and underground high voltage lines, illustrated with examples.

Problem-solving activities (15 in-class sessions of 50 minutes). These activities focus on quantitative problems dealing with the theoretical knowledge acquired in the theory classes. They provide students with deeper learning of the theory contents. The student will be encouraged to work the problems previously and in some stage, they will work cooperatively within teams.

Laboratory sessions (4 laboratory sessions of 3-4 hours).

Teamwork Evaluation (4 in-class sessions).

evaluation is also a learning tool with which the student checks the degree of understanding and assimilation has reached.

Periodically the student exercises and case studies to develop on their own is proposed. These may be obtained from the Digital Teaching Ring (<http://moodle.unizar.es>). This section also includes the preparation of laboratory practices and additional activities.

4.3. Syllabus

The program of the course will address the following contents:

1. Introduction to the High Voltage Transmission lines.
2. Elements of overhead and underground high-voltage power lines.
3. Electrical parameters of high voltage lines.
4. Line performance calculations.
5. Mechanical design of overhead spans.
6. Supporting structures.

Laboratory (4 laboratory sessions of 3-4 hours). Includes the following items 1. HV transmission systems.

2. Review the electrical parameters of HV lines.
3. Conductor types, bundle conductor.
4. Corona phenomena on AC and DC lines.
5. Electrical field and magnetic field in HV lines.
6. Insulator selection and clearances.
7. Line and structure locations.

4.4. Course planning and calendar

Schedule sessions and presentation of works

Theory lectures, problem-solving activities, and laboratory sessions are carried out on the campus? Rio Ebro? according to the schedule set by the center and published prior to the start date of the course (<http://eina.unizar.es>).

Faculty professors and lecturers have a duty of 6 hours of tutorials per week. These tutorials are not compulsory for students and they are intended to provide students with the information and guidance they need to succeed in their academic work. The timetable of tutorials is published by the Faculty for each semester.

The other activities will be planned depending on the number of students and will be announced in good time. They will be available on <http://moodle.unizar.es>

4.5. Bibliography and recommended resources

<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=29627&Identificador=14510>