Course guide
820129 - SEPEE - Electrical Power Systems

Last modified: 27/06/2026

Unit in charge: Barcelona East School of Engineering
Teaching unit: 709 - DEE - Department of Electrical Engineering.

Degree: BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Compulsory subject).

Academic year: 2026 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: JUAN JOSE MESAS GARCIA

Others:

Primer quadrimestre:
JAIME BUSTO ABADÍA - Grup: T11, Grup: T12
JUAN JOSE MESAS GARCIA - Grup: T11, Grup: T12

Segon quadrimestre:
JAIME BUSTO ABADÍA - Grup: M11, Grup: M12
JUAN JOSE MESAS GARCIA - Grup: M11, Grup: M12

PRIOR SKILLS

Those acquired in the subjects CALCULUS, ALGEBRA AND MULTIVARIABLE CALCULUS, NUMERICAL CALCULUS - DIFFERENTIAL EQUATIONS, ELECTRICAL SYSTEMS, CIRCUITS AND SIGNALS, ELECTRICAL MACHINES I / II, LOW AND HIGH VOLTAGE ELECTRICAL INSTALLATIONS I.

REQUIREMENTS

INSTAL·LACIONS ELÈCTRIQUES DE BAIXA I ALTA TENSIÓ I - Prerequisit
MÀQUINES ELÈCTRIQUES II - Prerequisit

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CEELE-23. Carry out calculations for the design of power lines and electric power transmission systems.
CEELE-24. Understand electrical power systems and their applications.

Transversal:
07 AAT N3. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.

TEACHING METHODOLOGY

The teaching methodology used in this subject can be divided into three parts:

- Master classes: theory and problems (30%)
- Laboratory sessions (10%)
- Individual work based learning (60%)

LEARNING OBJECTIVES OF THE SUBJECT

To provide knowledge on overhead line calculation and electric power systems:

- Components, structure and functions of the electric power transmission and distribution system.
- Overhead lines: Electrical parameters. Equivalent circuits. Steady state analysis. Overhead line calculation by using the per unit system (p.u.).
- Transformers: Types, connections and equivalent circuits.
- Load flow in power systems: Bus admittance matrix. Problem statement. Algorithms for resolution.
- Overhead line mechanical calculation: Types of supports. Calculation of the sag. Calculation of cable stresses. Influence of temperature and other atmospheric conditions. Calculation of state change. RLAT.

STUDY LOAD

Type	Hours	Percentage
Hours small group	15,0	10.00
Self study	90,0	60.00
Hours large group	45,0	30.00

Total learning time: 150 h

CONTENTS

Introduction

Description:
Components, structure and functions of the electric power transmission and distribution system.

Full-or-part-time: 6h 30m
Theory classes: 1h 30m
Self study : 5h

Overhead lines 1

Description:
Electrical parameters. Equivalent circuits.

Full-or-part-time: 17h 30m
Theory classes: 4h 30m
Laboratory classes: 3h
Self study : 10h

Overhead lines 2

Description:
Steady state analysis.

Full-or-part-time: 35h
Theory classes: 12h
Laboratory classes: 3h
Self study : 20h

Overhead lines 3

Description:
Overhead line calculation by using the per unit system (p.u.).

Full-or-part-time: 11h
Theory classes: 3h
Laboratory classes: 3h
Self study : 5h

Transformers

Description:
Types, connections and equivalent circuits.

Full-or-part-time: 35h
Theory classes: 12h
Laboratory classes: 3h
Self study : 20h

Load flow in power systems

Description:
Bus admittance matrix. Problem statement. Algorithms for resolution.

Full-or-part-time: 32h
Theory classes: 9h
Laboratory classes: 3h
Self study : 20h

Overhead line mechanical calculation

Description:
Types of supports. Calculation of the sag. Calculation of cable stresses. Influence of temperature and other atmospheric conditions. Calculation of state change. RLAT.

Full-or-part-time: 13h
Theory classes: 3h
Self study : 10h

GRADING SYSTEM

Any academic fraud, plagiarism or use or possession of unauthorised means in an assessment activity leads to a mark of zero (0) for the affected test or assignment. Furthermore, in accordance with the University's regulations, if disciplinary proceedings are initiated the subject is recorded as "Pending Assessment" until a decision is reached. These incidents are managed in accordance with the **Action Framework for Academic Integrity in Assessment at the UPC**.

The final Mark of the Subject (N_Asig) is calculated, rounded to the nearest tenth, using the formula

N_Asig = 0.172 • N_ExPar + 0.494 • N_ExFin + 0.167 • N_TP1 + 0.167 • N_TP2

where

N_ExPar is the Midterm Exam Mark
N_ExFin is the Final Exam Mark
N_TP1 is the Practice Assignment 1 Mark
N_TP2 is the Practice Assignment 2 Mark

IMPORTANT REMARKS:

- IT IS COMPULSORY to carry out the Practice Assignments proposed in the laboratory sessions to pass the subject.
- This subject does NOT have a Re-assessment Exam.

EXAMINATION RULES.

- The Midterm Exam and the Final Exam are individual, in-person and written.
- In addition to writing utensils, it is only permitted to have one sheet with formulas (a single original handwritten A4 sheet) to be delivered to the professor at the end of each of the exams, and a calculator without external connectivity (no mobile phone or tablet can be used as such).
- Maximum punctuality is kindly requested.

BIBLIOGRAPHY

Basic:

- Ramírez Rosado, Ignacio J. [et al.]. Problemas resueltos de sistemas de energía eléctrica. Madrid: Thomson, cop. 2007. ISBN 9788497324083.
- Bergen, Arthur R. Power systems analysis. 2nd ed. Upper Saddle River, N.J: Prentice-Hall, cop. 2000. ISBN 0136919901.
- Elgerd, Olle Ingemar. Electric energy systems theory : an introduction. 2nd ed. New York [etc.]: McGraw-Hill, cop. 1982. ISBN 0070192308.
- Glover, J. Duncan; Sarma, Mulukutla S. Power system analysis and design : with personal computer applications. 2nd ed. Boston: PWS Publishing Company, 1994. ISBN 0534939600.
- Ras Oliva, Enrique. Teoría de líneas eléctricas : de potencia, de comunicación, para transmisión en continua. 2ª ed. Barcelona: Marcombo, 1985. ISBN 8460058921.
- Stevenson, William D., Jr. Elements of power system analysis. 4th ed. New York [etc.]: McGraw-Hill, cop. 1982. ISBN 0070612781.