Course guide
820754 - SEPED - Electrical Power Systems in a Distributed Environment

Last modified: 16/05/2023

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

Degree: **Academic year:** 2023 **ECTS Credits:** 5.0
Languages: Catalan, Spanish, English

LECTURER

Coordinating lecturer: JUAN ANTONIO MARTINEZ VELASCO

Others: First semester:
JUAN ANTONIO MARTINEZ VELASCO - T10, T30

PRIOR SKILLS

It is recommended to have previous electrical knowledge.

REQUIREMENTS

Electrical engineering.

TEACHING METHODOLOGY

Teaching methodology:

The course teaching methodologies are as follows:

- Lectures and conferences: presentation of knowledge by lecturers or guest speakers.
- Participatory sessions: collective resolution of exercises, debates and group dynamics, with the lecturer and other students in the classroom; classroom presentation of an activity individually or in small groups.
- Theoretical/practical supervised work (TD): classroom activity carried out individually or in small groups, with the advice and supervision of the teacher.
- Homework assignment of reduced extension: carry out homework of reduced extension, individually or in groups.
- Homework assignment of broad extension: design, planning and implementation of a project or homework of broad extension by a group of students, and writing a report that should include the approach, results and conclusions.
- Evaluation activities (EV).

Training activities:

The course training activities are as follows:

- Face to face activities
o Lectures and conferences: learning based on understanding and synthesizing the knowledge presented by the teacher or by invited speakers.
o Participatory sessions: learning based on participating in the collective resolution of exercises, as well as in discussions and group dynamics, with the lecturer and other students in the classroom.
o Presentations (PS): learning based on presenting in the classroom an activity individually or in small groups.
o Theoretical/practical supervised work (TD): learning based on performing an activity in the classroom, or a theoretical or practical exercise, individually or in small groups, with the advice of the teacher.

- Study activities
o Homework assignment of reduced extension (PR): learning based on applying knowledge and presenting results.
o Homework assignment of broad extension (PA): learning based on applying and extending knowledge.
o Self-study (EA): learning based on studying or expanding the contents of the learning material, individually or in groups, understanding, assimilating, analysing and synthesizing knowledge.

LEARNING OBJECTIVES OF THE SUBJECT

Objectives
The main objective is that students acquire an overview of the current electrical system and are able to model the elementary grid elements, are able to do calculations related to load flow and calculations of current of short circuits, and therefore, are able to measure electrical protection necessary.
Learning outcomes
- Modelling of grid components. Load flow. Short circuit calculations.
- Electrical protection systems.
- Coordination of insulation. Statistical calculations of surges.
Upon completing the course, the student should:
- Be capable of criticising and analysing power grids.
- Be capable of doing the math required to find the load flow.
- Be capable of performing calculations of current of short circuits.
- Be capable of measuring the electrical protection necessary.
- Be capable of performing statistical calculations of surges.
- Understand and treat the coordination of insulation.

STUDY LOAD

Type	Hours	Percentage
Self study	85,0	68.00
Hours small group	30,0	24.00
Guided activities	10,0	8.00

Total learning time: 125 h

CONTENTS

1. Modelling of grid components

Description:
Modelling of grid components.

Specific objectives:
Modelling of grid components.

Related activities:
Guided activity

Full-or-part-time: 23h
Theory classes: 6h
Guided activities: 1h
Self study : 16h

2. Load flow. Short circuit calculations

Description:
Load flow. Short circuit calculations.

Specific objectives:
Load flow. Short circuit calculations.

Related activities:
Practical classes and guided activity.

Full-or-part-time: 50h
Theory classes: 8h
Practical classes: 4h
Guided activities: 6h
Self study : 32h

3. Protection in electrical systems

Description:
Protection in electrical systems.

Specific objectives:
Protection in electrical systems.

Related activities:
Practical classes and guided activity.

Full-or-part-time: 26h
Theory classes: 4h
Practical classes: 2h
Guided activities: 4h
Self study : 16h

4. Coordination of insulation. Statistical calculations of surges

Description:
Coordination of insulation. Statistical calculations of surges.

Specific objectives:
Coordination of insulation. Statistical calculations of surges.

Related activities:
Practical classes and guided activity.

Full-or-part-time: 26h
Theory classes: 4h
Practical classes: 2h
Guided activities: 4h
Self study : 16h

ACTIVITIES

1. Modelling of grid components

Description:
Modelling of grid components.

Specific objectives:
Deepen the knowledge of the subject.

Material:
Lecture notes and slides made by the professor.

Delivery:
According to the professor's specifications.

Full-or-part-time: 23h
Theory classes: 6h
Guided activities: 1h
Self study: 16h

2. Load flow. Short circuit calculations

Description:
Load flow. Short circuit calculations.

Specific objectives:
Deepen the knowledge of the subject.

Material:
Lecture notes and slides made by the professor.

Delivery:
According to the professor's specifications.

Full-or-part-time: 50h
Theory classes: 8h
Practical classes: 4h
Guided activities: 6h
Self study: 32h

3. Protection in electrical systems

Description:
Protection in electrical systems.

Specific objectives:
Deepen the knowledge of the subject.

Material:
Lecture notes and slides made by the professor.

Delivery:
According to the professor's specifications.

Full-or-part-time: 26h
Theory classes: 4h
Practical classes: 2h
Guided activities: 4h
Self study: 16h

4. Coordination of insulation. Statistical calculations of surges

Description:
Coordination of insulation. Statistical calculations of surges.

Specific objectives:
Deepen the knowledge of the subject.

Material:
Lecture notes and slides made by the professor.

Delivery:
According to the professor's specifications.

Full-or-part-time: 26h
Theory classes: 4h
Practical classes: 2h
Guided activities: 4h
Self study: 16h

GRADING SYSTEM

Written test (PE). 50%
Work performed individually or in groups (TR). 30%
Attendance and participation in practical activities (AP). 15%
Quality and performance of group work (TG) 5%

BIBLIOGRAPHY

Basic:
- Ramírez Rosado, Ignacio J. Problemas resueltos de sistemas de energía eléctrica. Madrid: Thomson, cop. 2007. ISBN 9788497324083.
- Gómez Expósito, Antonio; Conejo, Antonio J; Cañizares, Claudio. Electric energy systems : analysis and operation. Boca Raton: CRC Press, cop. 2009. ISBN 9780849373657.
- Gómez Expósito, Antonio. Análisis y operación de sistemas de energía eléctrica. Madrid: McGraw Hill Interamericana, 2002. ISBN 844813592X.