

# Course guide 820323 - GEEEN - Electricity Generation

**Last modified:** 02/10/2025

Unit in charge: Barcelona East School of Engineering

**Teaching unit:** 709 - DEE - Department of Electrical Engineering.

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

Academic year: 2025 ECTS Credits: 6.0 Languages: Catalan, Spanish

#### **LECTURER**

Coordinating lecturer: MARIA ELENA MARTIN CAÑADAS

**Others:** Primer quadrimestre:

JUAN CRUZ VAQUER - Grup: T11, Grup: T12

MARIA ELENA MARTIN CAÑADAS - Grup: T11, Grup: T12

# **PRIOR SKILLS**

Alternating current electric circuits analysis

# **REQUIREMENTS**

SISTEMES ELÈCTRICS - Prerequisit

# **DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES**

#### Specific:

CEENE-340. Apply the principles of operation and main technologies that allow the generation of electrical energy

# Transversal:

- 4. SELF-DIRECTED LEARNING Level 2: Completing set tasks based on the guidelines set by lecturers. Devoting the time needed to complete each task, including personal contributions and expanding on the recommended information sources.
- 3. EFFECTIVE USE OF INFORMATION RESOURCES Level 1. Identifying information needs. Using collections, premises and services that are available for designing and executing simple searches that are suited to the topic.
- 11. TEAMWORK Level 1. Working in a team and making positive contributions once the aims and group and individual responsibilities have been defined. Reaching joint decisions on the strategy to be followed.

# **TEACHING METHODOLOGY**

The subject will be structured in two types of classroom sessions:

- Classes of theory and solved examples: theoretical aspects and worked examples will be explained, and the items autonomously learned by the students will be commented.
- Practice sessions: Experiences will be done at the laboratory of electrical machines and simulations with specialised software may also be performed.

The students will do also off-site tasks including individual and teamwork.

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# **LEARNING OBJECTIVES OF THE SUBJECT**

The aim of the course is to enable the student to understand and analyze the different technologies of electric generators.

The specific objectives include:

- Understanding the principles of operation of the various electrical machines, focusing on synchronous and induction generators
- Analysingthe steady-state and transient regimes of the different electrical machines
- Understanding the operation and control principles of the electric generators connected directly to the network
- Understanding the operation and control principles of the electric generators connected to the network through a converter (wind and PV energy)

# **STUDY LOAD**

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

Total learning time: 150 h

#### **CONTENTS**

# (ENG) Basic principles

#### **Description:**

Basic principles of conversion of electrical energy. Classification of electric generator technologies.

Full-or-part-time: 30h Theory classes: 10h 30m Laboratory classes: 1h 30m

Self study: 18h

# (ENG) Technologies of electric generators

# **Description:**

Synchronous generators. Induction generators. Other electric generators. Fundamental aspects of each technology. Equivalent models. Applications.

Full-or-part-time: 60h Theory classes: 21h Laboratory classes: 3h Self study: 36h

# (ENG) -Generators directly connected to the electricity grid

# **Description:**

Operation of electrical generators connected directly to the network. Stationary and transient analysis. Control. Stability. Interactions with the network.

Full-or-part-time: 30h Theory classes: 10h 30m Laboratory classes: 1h 30m

Self study: 18h



# (ENG) Generators connected to the electric grid through a converter (wind and photovoltaic energy)

# **Description:**

Generator technologies. Converter technologies. Control systems. Wind and solar photovoltaic generation. Integration of renewable energy sources to the electricity grid.

**Full-or-part-time:** 30h Theory classes: 10h 30m Laboratory classes: 1h 30m

Self study: 18h

# **GRADING SYSTEM**

The final mark will be calculated according to the following equation NF=PR\*0.2+EP\*0.25+TR\*0.2+EF\*0.35

TF Work

PR Practices

EP Partial Exam

EF Final Exam

This subject will not have a re-evaluation exam.

The marks associated to the generic competence/s avaluation will beathe mean value of the marks of the laboratoy practices and the proposed work.

# **BIBLIOGRAPHY**

#### **Complementary:**

- Fitzgerald, A. E.; Kingsley, Charles; Umans, Stephen D. Electric machinery. 7th ed. Boston [etc.]: McGraw-Hill, cop. 2014. ISBN 9780071326469.
- Chapman, Stephen J. Electric machinery and power system fundamentals. New York: McGraw-Hill, 2002. ISBN 9780071226202.
- Boldea, I. Synchronous generators : the electric generators handbook. Boca Raton: CRC, 2006. ISBN 084935725X.
- Freris, L. L.; Infield, D. G. Renewable energy in power systems. Chichester, U.K: John Wiley & Sons, 2008. ISBN 9780470017494.
- Fraile Mora, Jesús. Máquinas eléctricas. 7a ed. Madrid [etc.]: Garceta, cop. 2015. ISBN 9788416228133.

# **RESOURCES**

#### **Hyperlink:**

- Atenea. Hi haurà materials disponibles a la web

#### Other resources:

Licensed software

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