

DIE-GITI-431 Power Systems Analysis

SEMESTER: Fall
CREDITS: 6 ECTS (4 hrs. per week)
LANGUAGE: Spanish
DEGREES: GITI

Course overview

This course is the natural extension of the previous course Electric Power Systems. Power flow, unbalanced systems and faulty systems are deeply studied. PSS/E power system simulator is used to solve some complex power systems.

Prerequisites

Basic knowledge of power system and circuits fundamentals.

Basic knowledge of electric machines.

Course contents

Theory:

- 1. Introduction to the electric power systems.** General description, typology, components, basic control concepts (frequency vs. power, voltage vs. reactive power, etc.).
- 2. Modeling of power transmission lines.** Parameters of lines, series (resistance and reactance) and shunt (susceptance). State-equations, distributed parameters, characteristic impedance and equivalent circuits.
- 3. Power flow calculation.** Introduction. Operation of power systems in steady-state. Basic equations. Resolution: Gauss-Seidel, Newton-Raphson, coupled and decoupled. DC approximation.
- 4. Unbalanced power systems analysis.** Fortescue theorem. Symmetric components method. Generator, transformer and line sequential models. Fault analysis (phase-to-ground, phase-to-phase, and phase-to-phase-to-ground). Fault analysis using matrix methods.

Textbook

- Elgerd, O.I.: "Electric Energy System Theory. An Introduction" Mc Graw Hill, 1983.
- J.J, Grainger, W.D. Stevenson: "Análisis de Sistemas de Potencia" Mc Graw Hill.

- Gómez Expósito, A. (e.a.): “Análisis y Operación de Sistemas de Energía Eléctrica”.
Mc Graw Hill, 2002.

Grading

The following condition must be accomplished to pass the course:

- A minimum overall grade of at least 5 over 10.

The overall grade is obtained as follows:

- Final exam 45%
- Other exams 45% (typically there are 2 additional short exams).
- Performance during the class 10%.