By the end of this module students should be able to acquire relevant data to evaluate grid power quality, to model permanent and dynamic transient regimes of electric grid elements and to plan and optimise grid design. Specifically, the student will:

- be able to perform different studies (permanent, dynamic or transitional regimes) to undertake in electric grids to ensure correct planning and operation
- get basic knowledge on grid modelling (static and dynamic)
- be able to perform stability studies
- get to know different aspects about power supply quality
- be able to perform an optimal sizing of renewable energies installations

Engineering analysis:
Graduates will be able to formulate and solve engineering problems related to Power Supply Quality. Investigations:
Graduates will be able to acquire relevant data to evaluate grid power quality.
Engineering design:
Graduates will be able to model permanent and dynamic transient regimes of electric grid elements, also to plan and optimise grid design.
Transferable skills:
Graduates will be able to work effectively as a professional and as team member in the resolution of technical problems related to integration of RE in electric grids. Also, graduates will demonstrate their abilities to communicate effectively in multinational groups.

Module contents
1. Electric system modelling
   - Introduction to the modelling and simulation of electric systems
   - Per unit system
   - Permanent regime simulation studies: load flows, short-circuits, sequence networks
   - Transient regime modelling: lines, transformer, SEP stability, generation
   - Modelado de sistemas eléctricos en régimen transitorio.
   - RE integration analysis
2. Quality of supply
   - Wind and solar farms verification procedures
   - Grid Codes and dynamic models for different wind turbines
   - Variable frequency drive
   - Slow voltage variations
   - Voltage fluctuations Flicker
   - Voids voltage and short cuts
   - Voltage pulses
   - Harmonic distortion
   - Voltage Imbalances
   - Network quality and renewable energy
   - Power quality analysers

Reader’s advisory

Links
Language of instruction
English
Duration (semesters)
1 Semester
Module frequency
jährlich
Module capacity
unlimited
Modulart
Pflicht
Lern-/Lehrform / Type of program
Lecture, Laboratory, Excursion, Tutorials
Vorkenntnisse / Previous knowledge

Examination
Final exam of module
Time of examination
After end of lectures of module
Type of examination
Written exam (50%): 2 hours
Subject’s work (10%): approx. 8 hours
(Subject’s work refers to the different assignments that students are asked to finish after a preliminary session during the lessons)
Presentation (40%): 20 minutes (developed
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