EE-472

Smart grids technologies

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Cursus	Sem.	Type
Electrical and Electronical Engineering	MA2, MA4	Obl.
Energy Science and Technology	MA2, MA4	Opt.
Energy minor	E	Opt.

Contact language	English
Credits	5
Session	Summer
Semester	Spring
Exam	Written
Workload	150h
Weeks	14
Hours	**5 weekly**
Lecture	2 weekly
Exercises	1 weekly
Practical work	2 weekly
Number of positions	

Summary

Learn the technologies and methodologies used in the context of the operation of future power grids and be able to deploy/implement/test them.

Content

1. Modern monitoring of power systems: synchrophasors estimation, time dissemination/alignment and phasor measurement units.
2. Grid topology assessment and compound admittance matrix calculus.
3. Formulation of the nodal injection and branch flow models of the load flow problem.
4. Power systems state estimation and bada data processing/assessment.
5. The optimal power flow problem.
6. Forecasting techniques of loads and stochastic renewables.
7. Stochastic oprimal power flow problems and applied model predictive controls.

Keywords

Smart grid, power systems

Learning Prerequisites

Required courses

Fundamental of electrical circuits and systems I and II, principles of power systems, convex optimization.

Recommended courses

Signal processing, discrete optimization methods, model predictive control.

Important concepts to start the course

Understanding electrical grids operational principles.

Learning Outcomes

By the end of the course, the student must be able to:

- Design monitoring and control platforms of smart grids
- Test a smart grid
- Implement a smart grid

- Analyze the performance of a smart grid

Transversal skills

- Plan and carry out activities in a way which makes optimal use of available time and other resources.
- Continue to work through difficulties or initial failure to find optimal solutions.
- Demonstrate the capacity for critical thinking
- Manage priorities.

Teaching methods

Ex cathedra, classroom integrated exercises and computer laboratory sessions.

Expected student activities

Attend lectures and labs
Do lab homeworks
Do online quizzes

Assessment methods

Written exam (50%) and graded lab reports (50%)

Resources

Moodle Link

- https://go.epfl.ch/EE-472

Prerequisite for

Master projects in the areas of power systems and energy conversion systems.