DALARNA UNIVERSITY

# Course Syllabus

## Active Electrical Networks 7.5 Credits*, First Cycle Level 2

### Learning Outcomes

The overall objective of the course is that the student shall be able to demonstrate an understanding of the construction of smart grids and how these should be optimized for efficient power transmission.

After completing the course, the student shall be able to:

- demonstrate an understanding of the structure of Europe's HVDC networks
- describe how a distribution network works
- explain why a transmission network is important
- describe how energy storage can be used to balance the electricity grid
- describe the opportunities that the electricity market provides to control the consumption and production of electricity
- demonstrate an understanding of different methods in local electricity generation and how they affect electricity consumption and load flexibility

### Course Content

The course covers how transmission power networks function, ranging from power generation facilities (water, nuclear, wind, solar, coal) to the use of electricity in industry and households. Furthermore, the course covers how conversion from AC to DC and vice versa functions. It also examines the transfer of electricity between countries and producers, and how to protect, regulate and compensate different grids.
Also included in the course is an examination of current network architecture and the way networks must adapt to a higher production of solar and wind power, as well as an examination of networks that transmit energy over whole continents.
Another important part of the course is an examination of what applies in local networks where electricity consumers also produce their own electricity: for example, in PV installations. The course concludes with a discussion about the difference between the electricity network for distribution and transmission, transfer of DC and AC, and the way to regulate, protect and balance the grid.

### Assessment

Written examination 5 credits (U-3-4-5) and laboratory work 2.5 credits (U-G).

* 1 Credit = 1 ECTS

**Forms of Study**
Lectures, laboratory work with preparation tasks

**Grades**
The Swedish grades U, 3, 4, 5.

**Prerequisites**
Building services technology 7,5 credits first cycle level
Electrical Power systems, 7.5 credits, first cycle

**Subject:**
Electrical Engineering

**Group of Subjects:**
Electrical Engineering

**Disciplinary Domain:**
Technology, 100%

**Approved:**
Approved 5 February 2015
Valid from 5 February 2015