



# **FEN3340 Dynamics of HVDC/FACTS systems in Real-Time Simulation 8.0 credits**

**HVDC/FACTS-systemens dynamiska förlopp i realtidsimulering**

This is a translation of the Swedish, legally binding, course syllabus.

## **Establishment**

Course syllabus for FEN3340 valid from Autumn 2019

## **Grading scale**

P, F

## **Education cycle**

Third cycle

## **Specific prerequisites**

FEG3214 Power System Stability and Control (or equivalent), and basic knowledge in HVDC and FACTS.

## **Language of instruction**

The language of instruction is specified in the course offering information in the course catalogue.

## Intended learning outcomes

After the course the student should be able to

- explain the different types of HVDC and FACTS technologies and their key operation and control principles
- identify the major components used in the HVDC and FACTS systems
- describe and demonstrate how HVDC and FACTS controllers can improve the dynamic stability of power systems
- explain the basic principles of real-time simulation and hardware-in-the-loop simulation
- develop a basic model of a power system with at least one type of HVDC/FACTS technology in OPAL-RT based real-time environment
- implement a supplementary damping controller for at least one type of HVDC/ FACTS technology in OPAL-RT based real-time environment

## Course contents

The course will be designed around theoretical lectures and hands on laboratory sessions, with a major emphasis on a systematic approach of modelling a power system which includes HVDC/FACTS technology in real-time simulation platform (OPAL-RT). In this course, the practical complexities around modelling a power system with a significant amount of power electronics based components, especially during hardware-in-the-loop kind of situations, will be discussed and demonstrated. Also, the course will involve some industry experts in the lectures to add the practical aspects of the operation and control of HVDC and FACTS technologies.

## Examination

- EXA1 - Examination, 8.0 credits, grading scale: P, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

If the course is discontinued, students may request to be examined during the following two academic years.

## Other requirements for final grade

To successfully complete the course, the student has to pass the following:

- the given tasks and assignments
- the presentation and demonstration of the real-time simulation based project

- written exam

## Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.