



EH2741 Communication and Control in Electric Power Systems 6.0 credits

Kommunikation och styrning i elkraftsystem

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

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

Establishment

Course syllabus for EH2741 valid from Spring 2019

Grading scale

A, B, C, D, E, FX, F

Education cycle

Second cycle

Main field of study

Electrical Engineering

Language of instruction

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

Intended learning outcomes

The purpose of the course is to introduce the basics of information and control systems for protection, automation and control of power systems. This applies both to traditional power systems, as well as those with large amounts of renewable power sources. After the course the student should be able to:

- Describe the functions of the primary equipment in the power system that is relevant for protection, automation and control.
- Analyze substations and simple power systems in terms of reliability protection, automation and control needs.
- Describe the function and architecture of information and control systems used for protection, automation and control of power systems.
- Describe the function and architecture of communication systems used for information & control systems for power system control.
- Describe the importance of information & control systems for the ability to connect large amounts of renewable power sources.
- Analyze and develop basic systems for substation automation and protection.
- Analyze and develop basic information & control systems for system-wide control from control rooms, e.g. SCADA systems and EMS applications.
- Construct a state estimator for power systems.
- Describe relevant interoperability standards in the field, such as IEC 61850 and IEC 61970.
- Describe the threats and risks associated with the use of information & control system for controlling the electric power system, known as Cyber Security.

Course contents

Communication and control of power systems is a large and comprehensive topic including many different fields ranging from power system instrumentation to power system modeling and control systems theory. This course provides a wide perspective on the field, opening for continued studies in specialized subjects, its focus is on design, implementation and use of information and control systems for protection, automation and operation of restructured power systems. The course is inter-disciplinary, covering electrical power engineering as well as computer and communication system engineering.

Disposition

The course consists of three course blocks that deal with three aspects of information & control systems for power system control, local systems for automation & protection, communication systems, and systems at the control-room level. Each block consists of project work including laboratory work and in addition, a written mid-term test (three in total).

The first block covers primary equipment, systems for measurement and protection and automation systems. The block includes analyzing and developing systems for automation and protection in theory and in practice.

Block two deals with communication systems at local and central level. The block includes introduction to modern communications solutions for power system control, and development of communication systems in theory and practice in the form of laboratory work.

Block three cover systems for power system control from the Control Room level, the block includes analysis and development of state estimators and simple control room applications and SCADA systems.

Specific prerequisites

For students taking this as an individual course outside of a program, the eligibility criteria are already completed 90 ECTS credits within mathematics, computer science, electrical engineering or similar.

Course literature

Kurskompendium som tillhandahålls via kursens hemsida 3 veckor före kursstart.

Course literature is provided on the course homepage 3 weeks before start of the course.

The list of literature may be updated during the course.

Equipment

None

Examination

- PRO1 - Project Assignment 1, 2.0 credits, grading scale: P, F
- PRO2 - Project Assignment 2, 2.0 credits, grading scale: P, F
- PRO3 - Project Assignment 3, 2.0 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.

The examination is based on project assignments performed in groups and individual mid-term exams.

Other requirements for final grade

To pass the course (Grade E) the student has to complete the basic level of all project assignments (PRO1, PRO2, PRO3). For higher grades the student must complete the advanced

level of some or all project assignments. The grade in the course is based on the results of the project assignments and score on the mid-term tests.

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.