EH2740 Computer Applications in Power Systems, basic course 7.5 credits

IT tillämpningar i elkraftsystemet, grundkurs

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

Establishment

Course syllabus for EH2740 valid from Spring 2011

Grading scale

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

Education cycle

Second cycle

Main field of study

Electrical Engineering

Specific prerequisites

Bachelor's degree (180 higher education credits), or equivalent qualifications. Documented proficiency in English corresponding to English B/ English 6.

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 use of Information and Control Technologies for Power System Management. The specific course goals are that the student shall be able to:

- Describe the functionality of primary equipment necessary for automation and control of power systems
- Analyze simple power systems from an automation and control perspective
- Describe the concept and use of the IEC 61850 standard for utility automation

· Apply the IEC 61850 standard for utility automation to build simple automation and control systems for small power systems.

· Describe the functionality of secondary equipment used for automation and control of power systems

· Describe the concepts and structure of the IEC 61968/61970 standards for information exchange for power system control.

· Apply the IEC 61968/61970 standard to information exchange needs in power system management

· Describe the structure and design wide area communication solutions for power system control and operation.

· Develop a simple Power State Estimator for power system control purposes.

Course contents

Cost efficient operation of deregulated electric power system is completely dependent upon well functioning ICT systems to fulfill requirements on reliability and quality. These ICT systems are used for protection, measurement, monitoring and control of components and sub-systems, like power stations and substations. Additionally, the development towards **Smart grids** that can accommodate large amounts of renewable production and changing consumer patterns, including large scale use of electric vehicles gives the ICT systems an even greater role in the future power system.

The course covers the IT systems, technologies and standards that are constitute modern information and control systems used in the power system. Course content includes studies of secondary systems used for automation and protection in substation including the IEC 61850 standard; SCADA systems and communication solutions for Local and Wide Area Networks, including the IEC 61870-101/104 standard; technologies for information exchange and systems integration in the power industry including IEC 61968/61970 – the **Common Information Model** and also EMS application functions such as state estimation.

Disposition

The course consists of a series of traditional lectures covering the theoretical content of the course. In addition a number of seminars in which problems are discussed in groups and together with the course teachers. The first part of the course is devoted to primary and secondary equipment for automation and protection of the power system. Thereafter follows four course parts that contain lectures, seminars and project assignments. These parts are Development of SCADA systems, power system information modeling, Power system state estimation and finally configuration of protection and control systems.

Course literature

Kurskompendium som tillhandahålls vid kursstart

Examination

- INL1 - Assignment, 3.0 credits, grading scale: P, F
- INL2 - Assignment, 1.0 credits, grading scale: P, F
- KON1 - Examination, 1.5 credits, grading scale: P, F
- INL3 - Assignment, 1.0 credits, grading scale: P, F
- INL4 - Assignment, 1.0 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.

All assignments are individual, and the total course grade (A-F) is determined by the total of the score gained for each of the assignments.

Other requirements for final grade

All assignments in the course need to be completed

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.