FEI3390 Reliability Evaluation of Sustainable Electric Power Systems (RSEPS) 7.5 credits

Tillförlitlighetsanalys av uthålliga elkraftsystem

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

Establishment

Course syllabus for FEI3390 valid from Spring 2021

Grading scale

P, F

Education cycle

Third cycle

Specific prerequisites

Entry requirements for this course is equivalent to master exam in Electrical Engineering, or corresponding and with basic knowledge in statistics methods.

Language of instruction

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

Intended learning outcomes

After completing the course, the participant should be able to:

- Problematize the electric power system as part of the transformation of the energy system for a sustainable society.
- Master basic terminology and concepts for reliability analysis.
- Analyze a system with the following methods and techniques for reliability analysis:
- Network method for analysis of independent components, • Methods for identifying critical components, • Marcov modeling, • Lifetime modeling.
- Perform electric power system reliability analysis including the following aspects:
- Requirements and availability of data. • Availability of test systems and tools, • Adequacy and security assessment, • Protection system reliability, • N-1 criteria analysis, • Load point and system indices, • Lifetime extensions.
- Master basic terminology and concepts for asset management and maintenance management based on standard ISO 55 000.
- Formulate a strategy for maintenance management based on the method for reliability-based maintenance (RCM) and quantitative method RCAM (Reliability Centered Asset Management). This includes, for example, knowledge of performing; failure mode effect analysis, methods for condition monitoring and predictive models for maintenance.
- Perform life cycle cost analysis (LCC) including basic investment and risk analysis including aspects of circular economy.

Course contents

This course will give a thoroughly introduction of fundamental reliability theory and basic models for analysis. The theories are generic and applicable for any technical system. This course is focused on application for electric power systems and its equipment in the context of being an enabler for the future sustainable society. Moreover the course includes introduction to methods and concepts related to: asset management, predictive maintenance methods, life cycle cost analysis and circular economics. Examples will be given from practical and own research studies. The application examples include: generation (hydro, nuclear and wind, solar), transmission and distribution and main components (cables, lines, circuit breakers, transformers) and usage and storage (meters, electrical vehicles, battery storage). The overall objectives of the course are that the participants after completed course shall be able to use: reliability assessment and asset management methods as major tools for decision support for design, operation, maintenance and planning of electric power systems.

Examination

- EXA1 - Examination, 7.5 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.

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.