



# FEI3330 Insulation Diagnostics and Monitoring of Power Equipment, PhD Course 5.0 credits

Isolationsdiagnostik och tillståndskontroll för kraftapparater, doktorandkurs

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 FEI3330 valid from Autumn 2011

## Grading scale

## Education cycle

Third cycle

## Specific prerequisites

MSc in electrical engineering, physical engineering or similar. The course FEI3230 is good to have, but not compulsory.

## 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:

- describe the mechanisms behind ageing and deterioration of electrical insulation systems
- describe the principle of operation for basic methods of diagnostics and monitoring
- analyze the information content given by the different instruments
- analyze possible error sources in the results
- use and develop models for interpretation of measurement results based on equipment design and material properties
- identify when there is a need or not for a complementary high voltage stress test

## Course contents

Overview of insulating materials in high voltage equipment. Electrical insulation systems and design concepts. Degradation mechanisms and defects. Basic methods for diagnostics and monitoring based on insulation resistance, loss tangent, and capacitance. Advanced methods based on dielectric spectroscopy, polarisation and depolarisation currents, recovery voltage. Partial discharge measurements based on oscilloscope techniques, phase resolved acquisition techniques, acoustical PD measurements, PD localisation. On-line techniques. Chemical and physical analyzing methods. High voltage test methods: AC, DC and impulse. Power equipment: generators, breakers, transformers, cables, capacitors, outdoor insulation, etc.

## Disposition

Lectures (12\*2h = 24h), 6 homework problems, presentations by participants on solutions to homework problems (2\*6h = 12h), 1 individual project on a particular component and with a particular method, 3 field measurements: cable, transformer and generator

## Course literature

R.E. James and Q.Su, **Condition Assessment of High Voltage Insulation in Power System Equipment**; Compendia: H.Edin, **Insulation diagnostics and monitoring of power equipment**, containing lecture notes, articles and selected chapters from other books.

## Examination

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.

## Other requirements for final grade

Participated (short presentation every time) in 5 out of 6 homework problems. Accepted (80% correctness) solutions to 5 of 6 homework problems. Participated in 2 out of 3 field measurements. Accepted solution to individual project.

## 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.