

Course

HSUT - High Voltage Transmission Technology

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^ General information

Long name	High Voltage Transmission Technology
Approving CModule	<u>HSUT_MaET</u>
Responsible	Prof. Dr. Christof Humpert Professor Fakultät IME
Level	Master
Semester in the year	summer semester
Duration	Semester
Hours in self-study	60
ECTS	5
Professors	Prof. Dr. Christof Humpert Professor Fakultät IME
Requirements	Basics of electrical engineering and electronics Basic understanding of electric fields in dielectrics
Language	German
Separate final exam	No

^ Lecture / Exercises

Learning goals

Knowledge

Overvoltages and insulation coordination

- Generation and categories of overvoltages
- Propagation of overvoltages
- Traveling waves
- Reflections
- Limitation of overvoltages
- Types of surge arresters
- Properties, structure and selection

Systems of high voltage transmission

- High-voltage AC transmission (HVAC)
- Optimal transmission voltage
- Structure and different types of switchgears, their properties and applications
- High-voltage DC transmission (HVDC)
- Advantages and disadvantages in comparison to HVAC
- Structure and operation of converter stations
- Cost comparison to HVAC systems
- HVDC grids

Equipment of high voltage transmission

- Circuit breakers
- Principle of operation
- Different Types and their applications
- Circuit breakers for HVDC
- Superconducting equipment (cables, current limiters)
- Principle of operation and applications
- Cooling technology
- Losses and costs

Skills

Determine the stresses of transmission systems

- Calculate operating voltages and overvoltages for a given voltage level
- Plan limitation of overvoltages
- Analyze and calculate traveling wave processes (refraction, reflection)
- Derive current carrying capacity and maximum losses

Determine business aspects

- Carry out investment cost comparison
- Perform operating cost comparison

Expenditure classroom teaching

Type	Attendance (h/Wk.)
Lecture	2
Exercises (whole course)	2
Exercises (shared course)	0

Separate exam

Exam Type

interview (discussion) about special issues in scenario, project assignment or literature research

Details

Structured oral examination:

- Discussion of advantages and disadvantages of current and future technologies with regard to the requirements of transmission systems
- Calculations of voltage stress in nominal and fault cases
- Discussion of suitable measures to reduce the stresses
- Simplified profitability calculations

Minimum standard

60 % correct answers

^ Project

Learning goals

Knowledge

Electric field calculation at AC and DC

Influence of material properties and frequency of applied voltage

Skills

Solve project task in the team

Compile the basics of a calculation software

Perform numerical calculations

Compare numerical results with analytical

Discuss results related to practical application

Summarize results in a report

Expenditure classroom teaching

Type	Attendance (h/Wk.)
Project	0
Tutorial (voluntary)	0

Separate exam

Exam Type

working on projects assignment with your team e.g. in a lab)

Details

Evaluation of the project report

Minimum standard

80% of the calculation results correct

70% of the evaluation performed correctly

70% of the discussion makes sense

^ Practical training

Learning goals

Knowledge

Generation and measurement of AC, DC and impulse voltages

Propagation and limitation of overvoltages

Skills

Plan high voltage tests

Dimension high voltage test circuits

Determine test criteria for components of high voltage technology

Summarize results in a report

Expenditure classroom teaching

Type	Attendance (h/Wk.)
Practical training	1
Tutorial (voluntary)	0

Separate exam

Exam Type

working on projects assignment with your team e.g. in a lab)

Details

Observation of the lab exercises performed largely independent

Evaluation of reports of the lab exercises

Minimum standard

80 % of the measurement results correct

70 % of the evaluation performed correctly

70 % of the discussion makes sense