Zurich University of Applied Sciences

School of Engineering

t.EL3 - Elektrizitätslehre 3

Person responsible for the course:	Martin Schlup, spma
Responsible OU:	
ECTS:	4
Valid for:	2012/2013
Last saved:	20.06.2013 15:56

Expertise:

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Methodological skills:

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Social skills:

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Personal skills:

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Learning objectives:

The students can calculate and simulate the behaviour of harmonically excited, stationary oscillating, linear systems with adequate mathematical means, this especially for alternating current single and multi-phase systems.

They can mathematically analyse and describe the frequency response of these systems. They know the main frequency characteristics of simple systems and can relate them to their physical components. Besides they know the most important frequency domain properties of real, linear electric elements.

They know the basics of transmission line theory, especially for pulse propagation.

They know some elementary properties of electromagnetic fields.

Course content:

Lecture

o Single phase alternating current (AC): description of linear systems under harmonic excitation with complex number arithmetic (complex variables, impedance, admittance, real, reactive and complex apparent power)

o Three-phase AC: symmetric an asymmetric loads connected to a rigid power supply, compensation of reactive power

o Frequency response of linear circuits of 1st and 2nd order: analysis, synthesis and simulation (Matlab/Simulink) of frequency response characteristic, Bode diagram, Nyquist plot (for 2nd order systems: resonance, Q factor/damping ratio

o Behaviour of real electric circuit elements (resistors, capacitors, coils, transducers/transformer): skin-effect, AC models, losses and quality factor (Q-Factor), nonlinearities

o Transmission line theory (system with distributed parameters, linear line model): signal propagation (pulse) on lossless line (wave equation and general solution, propagation velocity, line impedance, reflection, transmission and impedance matching), line damping

o Electromagnetic fields: refraction laws, electromagnetic pressure, energy density and flow (Poynting vector), wave propagation and polarisation

Lab Exercises

o AC systems: measuring of impedance, admittance, real, reactive and apparent power

o Synthesis and measurement of frequency response for simple circuits (e. g. analog low pass and bandpass filters)

o Parameter measurement and identification for symmetric transformer AC model

o Simple three-phase power supply system with symmetric and asymmetric loads, compensation of reactive power

o Line interference phenomenons and counter measures: capacitive, inductive and galvanic disturbances

o Transmission line: velocity of wave propagation, line impedance, impedance matching and reflections, line damping

Previous knowledge:

t.EL1 and t. EL2 and successfully completet assessment.

Teaching method:

Type of lesson:	**Number of lessons per week:**
Lecture	9x(2+2)
Tutorial/Practicum	5*4
Block instruction	

Assessment:

According to the table or as specified in writing by the lecture at the beginning of the semester!

description	**type**	**form**	**scope**	**assessment**	**weighting**
Performance records during school hours		various		Grade	40%
Semester end exam		writen	90 min.	Grade	60%

Language of instruction:

english

Instruction material:

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Additional literature:

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Comments:

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