HE1200 Electrical Principals and Measurement 9.0 credits

Ellära och mätteknik

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 HE1200 valid from Autumn 2017

Grading scale

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

Education cycle

First cycle

Main field of study

Electrical Engineering,Technology

Specific prerequisites

Basic knowledge in mathematics (algebra, matrices, equation systems, differential equations, and complex numbers).

Language of instruction

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

Intended learning outcomes

0BLearning outcomes

The main objective is to provide knowledge of electrical components and their interaction in electrical networks, knowledge of some methods for calculating the dependence of time and frequency for electrical circuits. The course will also provide knowledge about electrical instruments and common methods for measuring and training in using computer aid for simulating and measuring in electrical circuits.

After completion of the course the student should be able to:

·   Explain the basic electrical and magnetic concepts.

·   Apply basic electrical network theory in order to calculate direct current networks as well as alternate current networks.

·   Calculate the time constant and compute its effect in capacitive and inductive circuits, especially at closing and opening in DC networks.

·   Use programs for circuit simulation for any electrical circuit and simulate its function with respect to currents, voltages, pulse response, frequency response and time dependence.

·   Describe passive components and explain the characteristics and uses of passive components and electrical networks.

·   Explain the function of the ideal operational amplifier, and analyze of basic circuits with operational amplifiers.

·   Explain the characteristics of diodes, transistors.

·   Define and calculate gain, input and output impedances for amplifiers based on operational amplifiers and transistors.

·   Determine transfer function for frequency dependent amplifier circuits, draw bode-plots (magnitude and phase).

·   Handle electrical generators and measuring instruments such as voltage sources, function generators, multi meters and oscilloscopes.

Course contents

- Charge, direct current and alternating current, voltage and power, electrical and magnetic field.
- Ohm's and Kirchhoff's laws.
- Analysis methods: Mesh and Nodal analysis.
- Networks theorem: superposition, Thévenin, Norton and Maximum power transfer theorem.

- Knowledge of components (R, L, C) and ideal transformer.
- Phasor notation. Mathematical operations with complex numbers.
- R-C, R-L and R-L-C circuits.
- Different types of diodes, transistors including some of their basic networks.
- Operational amplifier.
- Knowledge of measurement instruments (multimeters and oscilloscopes).

Course literature

- Boylestad, Introductory Circuit Analysis,13:e upplagan, Pearson New International Edition, ISBN 978-1-292-09895-1, gäller för del A
- Analog elektronik, Molin, Upplaga: 2, Förlag: Studentlitteratur År: 2009, ISBN: 978-91-44-05367-7, gäller för del B

Examination

- LABA - Lab Work, 4.0 credits, grading scale: P, F
- TENA - Examination, 3.0 credits, grading scale: A, B, C, D, E, FX, F
- TENB - Examination, 2.0 credits, grading scale: A, B, C, D, E, FX, 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.

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.