EQ1100 Signals and Systems, part II 7.5 credits

Signaler och system, del II

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

Establishment

Grading scale

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

Education cycle

First cycle

Main field of study

Electrical Engineering, Technology

Specific prerequisites

For single course students: General admission requirements, 60 credits and documented proficiency in English B and Swedish B or equivalent

Language of instruction

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

Intended learning outcomes

The aim is to provide basic knowledge about continuous-time and discrete-time linear systems and their dynamical properties.

After completing the course You should be able to

- understand the meaning and practice relevance of system properties such as linearity, time invariance, stability and causality.
- use mathematical transform methods to analyze linear time invariant systems, both continuous time and discrete time systems and combinations thereof. Especially:
- analyze continuous time systems using Fourier transform as well as unilateral and bilateral Laplace transform.
- analyze discrete time systems using Discrete Time Fourier Transform as well as unilateral and bilateral Z-transform.
- interprete, analyze and synthesize continuous time systems in the form of electrical circuits and discrete time systems in the form of block diagrams or program code.
- describe LTI systems and calculate their output signal, using impulse response, convolution, transfer function and frequency response.
- calculate poles and zeros of an LTI system and relate their position to system properties like transfer function and frequency response.
- in a simple way calculate the output signal for a stationary sinusoid.
- use mathematical software like MATLAB to analyze and simulate LTI systems and for basic filter design.
- describe and calculate the output of sampling and reconstruction (pulse amplitude modulation), for arbitrary input signals, sampling frequencies and pulse shapes, in the time and frequency plane.
- know about the theoretical and practical relevance of the sampling theorem.
- analyze sampled systems.
- know about filter concepts like bandwidth and ideal filter types.

Course contents

Linear systems: System properties (stability, causality, time-invariance), block diagrams, impulse response, convolution.

Frequency description: Frequency response, frequency function, filtering.

Transform methods for time continuous and time discrete signals and systems, Fourier tranforms, Laplace transform and Z-transform.

Sampling, pulse amplitude modulation and sampled systems.

Course literature

One of the following 2 books:

– H.P. Hsu, “Shaum’s Outline of Signals and Systems”, McGraw-Hill, 1995, ISBN 0-07-030641-9

– B.P. Lathi, “Linear Systems and Signals”, 2nd edition, Oxford University Press, ISBN 0-19-515833-4

Examination

- LAB2 - Assignment, 1.0 credits, grading scale: P, F
- TEN1 - Examination, 6.0 credits, grading scale: A, B, C, D, E, FX, F
- LAB1 - Laboratory Work, 0.5 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.

Other requirements for final grade

Written exam (TEN1; 6 ECTS).
Laboratory exercise (LAB1; 0,5 ECTS).
Homework problem (LAB2; 1 ECTS).

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.