EQ1120 Discrete Time Signals and Systems 6.0 credits

Tidsdiskreta signaler och system

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 EQ1120 valid from Spring 2019

Grading scale

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

Education cycle

First cycle

Main field of study

Technology

Specific prerequisites

Mandatory for CELTE.

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 discrete-time signals and systems, how they can be described and analyzed by using difference equations and transform methods, and be implemented in software like Matlab.

After completing the course you should be able to

- Solve simple linear difference equations with and without initial conditions.
- Numerically implement and simulate discrete time systems in software like MATLAB.
- Understand the meaning and practical relevance of system properties such as linearity, time invariance, stability and causality.
- Describe linear time invariant systems by the impulse response and calculate their output signal by using convolution given an input signal.
- Compute the discrete time Fourier transform and its inverse for given signals based on the definition along with general properties of transforms.
- Compute the single and double sided Z-transform for a given signal, use these to solve difference equations and derive output signals, and by partial fraction expansions and table of formulas be able to go back to time domain descriptions.
- Interpret pole zero locations in terms of frequency domain properties.
- Determine stability based on pole location for causal LTI systems.
- Know about concepts like sampling and reconstruction by pulse amplitude modulation.
- Understand folding in time and frequency domain.
- Describe a sampled signal's spectrum in terms of the spectrum of the original signal and the importance of the Nyquist criterion and sampling theorem.
- Compute the total transfer function of a sampled system.
- Orally and in writing describe how a system solves a given signal processing task.

For higher grades you should be able to

- Show understanding of the concepts between the different descriptions of discrete time system and their properties in time and frequency domain.
- Be able to choose suitable methods for solving specific tasks.
- Combine different concepts and methods from the course and apply them on more complex mathematical and technical problems.

Course contents

Linear difference equations. characteristic equation, discrete-time Fourier transform, single and double sided Z-transform, discrete-time systems and system properties, impulse response, convolution, transfer function, frequency function, sinus in sinus out, poles and zeroes, stability criteria for discrete time systems, sampling and reconstruction by pules amplitude modulation, sampling theorem, system realizations in Matlab.

Course literature

See course homepage.

Examination

- PRO1 - Project Work, 1.0 credits, grading scale: P, F
- PRO2 - Project Work, 1.0 credits, grading scale: A, B, C, D, E, FX, F
- TEN1 - Exam, 4.0 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.

Other requirements for final grade

Passing grade in all partial examinations.

Final grade based on 80% from TEN1 and 20% from PRO1.

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.