DT1130 Spectral Transforms 7.5 credits

Spektrala transformer

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 DT1130 valid from Autumn 2009

Grading scale

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

Education cycle

First cycle

Main field of study

Technology

Specific prerequisites

For single course students: completed upper secondary education including documented proficiency in Swedish corresponding to Swedish B, English corresponding to English A. Furthermore: 15 hp in mathematics.

Language of instruction

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

Intended learning outcomes

The student should after the course be able to

* analyse audio signals using spectrum/spectrogram and explain relations between spectrum, analysis window length, analysis bandwidth and resolution in time and frequency domains

* explain and calculate the consequences of sampling and quantisation of analogue signals

* express signals mathematically in terms of complex phasors, and utilise fourier series to describe periodic signals

* analyse simple linear systems using the Z-transform, and calculate various properties of theese such as filter equation, transfer function, pole- and zero configuration, magnitude response and impulse response and relate these to each other

* explain and apply convolution of signals in one and two dimensions

* explain function and scope of use, and numerically compute the discrete fourier transform, and state the basic principle and computational properties of the FFT algorithm

* account for basic principles and algorithms used in filtering and spectrally based compression of images

* use Matlab for general computation and visualisation task, especially filtering and spectral treatment of sounds and images.

Course contents

Oscillations and complex phasors. Time-discrete signals, quantiszation and sampling. Linear systems, digital filters with and without feedback. Impluse response and step response. Frequency response and transfer function. Convolution. Z-transform. Periodic signals and fourier series. Dicrete fourier transform, FFT. Spectrum and spectrogram. Windowing. Source-filter models. Formants and fundamental frequency. Filtering, convolution and transforms in two dimensions. Discrete cosine transform and JPEG-based image compression.

Course literature

Will be announced at least 4 weeks before the course starts at the web page for the course.

Examination

- LAB1 - Laboratory Work, 3.0 credits, grading scale: P, F
- TEN1 - Examination, 4.5 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.

In this course all the regulations of the code of honor at the School of Computer science and Communication apply, see: http://www.kth.se/csc/student/hederskodex/1.17237?l=en_UK.

Other requirements for final grade

One written examination (4,5 university credists) and a laboratory course (3 university credists) with two mandatory lab assignments and one programming assignment.

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.