Course syllabus

Digital signalbehandling och dess transformer
Systems, Signals and Discrete Transforms

EITG10, 6 credits, G2 (First Cycle)

Valid for: 2023/24
Faculty: Faculty of Engineering, LTH
Decided by: PLED E
Date of Decision: 2023-04-11

General Information

Main field: Technology.
Compulsory for: Pi2
Language of instruction: The course will be given in English on demand

Aim

We use daily equipments in which the signals are stored and treated digitally. From the basic signal processing used in CD-players to advanced processing used in MP3 coding of music, speech coding in GSM, digital video and image processing. The course gives the basic knowledge in digital signal processing and knowledge of signal properties in the time domain as well as in the frequency domain.

Learning outcomes

Knowledge and understanding
For a passing grade the student must

- be able to identify applications of digital signal processing and how this is used in modern equipments
- be able to describe digital signals and the properties of digital signals
- be able to describe the relation between the properties in the time domain and in the frequency domain
- understand the relation between analog and discrete signals' frequency properties

- understand a Toeplitz-matrix based description of digital signal processing
- understand the relation between the Fourier transform and the eigenvalues of a large scale digital LTI system

Competences and skills
For a passing grade the student must

- be able to analyze the signal properties in the time domain and in the frequency domain
- be able to describe the properties of digital circuits
- be able to analyze the frequency components of sampled analog signals
- be able to perform eigenvalue analysis of a digital LTI system

Judgement and approach
For a passing grade the student must

- be able to handle digital signal methods in practical applications
- be able to read literature as well as treat with standards in this area

Contents

The course deals with time discrete signals and systems. Items such as the Fourier Transform, the Discrete Fourier Transform (DFT) and the z-transform are treated in the course. Also, system function and frequency functions are introduced as well as digital filters. Digital processing of analogue signals using A/D and D/A conversion is studied. Furthermore, a Toeplitz-matrix based description of signal processing is presented where the relation between the Fourier transform and eigenvalue analysis is central. In the laboratory work, practical applications of digital signal processing such as speech signals processing, biomedical signals processing, and communication signals processing are treated. Also, the course includes basic filter design using Matlab and digital signal processors (DSP).

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)
Assessment: Written exam, fulfilled laboratory work and partial tests during the course.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Parts
Code: 0121. **Name:** Written Examination.
Credits: 5. **Grading scale:** TH. **Assessment:** Approved Written exam
Code: 0221. **Name:** Laboratory Works.
Credits: 1. **Grading scale:** UG. **Assessment:** Approved Laboratory work.

Admission

Assumed prior knowledge: FMAF01 Analytic Functions and FMAF05 Systems and Transforms.
The number of participants is limited to: No
The course overlaps following course/s: EITF15, EITF75, EITA50, BMEA05, BMEF25

Reading list

- Proakis J G, Manolakis D G. : Digital Signal Processing. , Principles, Algorithms and Applications. Pearson Prentice Hall, ISBN: 0-13-187374-1.

Contact and other information

Course coordinator: Johan Thunberg, johan.thunberg@eit.lth.se
Course homepage: http://www.eit.lth.se