

Digital Signal Processing

Programme course

6 credits

Digital signalbehandling

TSRT78

Valid from: 2017 Spring semester

Determined by

Board of Studies for Electrical
Engineering, Physics and Mathematics

Date determined

2017-01-25

Main field of study

Electrical Engineering

Course level

Second cycle

Advancement level

A1X

Course offered for

- Communication Systems, Master's Programme
- Computer Science and Engineering, M Sc in Engineering
- Industrial Engineering and Management - International, M Sc in Engineering
- Industrial Engineering and Management, M Sc in Engineering
- Information Technology, M Sc in Engineering
- Biomedical Engineering, M Sc in Engineering
- Computer Science and Software Engineering, M Sc in Engineering
- Mechanical Engineering, M Sc in Engineering
- Applied Physics and Electrical Engineering - International, M Sc in Engineering
- Applied Physics and Electrical Engineering, M Sc in Engineering

Entry requirements

Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

Prerequisites

Signal Theory, Signals and Systems.

Intended learning outcomes

The student should after the course have the ability to describe the most important methods and algorithms for signal processing, and be able to apply these on signals of various kinds. More specifically, after the course the student should have the ability to

- Compute the discrete Fourier transform (DFT) and understand scaling effects and practical limitations implied by finite data length and sampling.
- Use the DFT for filtering and know how circular convolution is avoided.
- Explain the basic signal models and their relationship.
- Perform transform-based and model-based spectral analysis, and understand the compromise between resolution and noise suppression.
- Describe the theory for model estimation, and be able to apply algorithms for this purpose and validate an estimated model.
- Describe the basics in optimal filtering and be able to compute a Wiener filter for simple examples.
- Describe the premises for Kalman filtering, and be able to apply a Kalman filter to data and tune it to compromise tracking speed, transient behavior and noise suppression.
- Describe the most important adaptive filters, some common applications, and be able to apply and tune an adaptive filter to compromise parameter tracking speed and noise suppression.

Course content

Transforms of signals and systems, in particular the discrete Fourier transform. Spectral analysis. Filter design. Modelling of signals. Filter design using statistical theory, Wiener and Kalman filters. Methods and applications in adaptive filtering, for example noise cancelling.

Teaching and working methods

The course is organized in lectures/classes and laboratory work.

Examination

| | | | |
|------|------------------------------|-----------|------------|
| LAB1 | Laboratory Work | 1 credits | U, G |
| DAT1 | Written/Computer Examination | 5 credits | U, 3, 4, 5 |

Grades

Four-grade scale, LiU, U, 3, 4, 5

Other information

Supplementary courses: Sensor fusion

Department

Institutionen för systemteknik

Director of Studies or equivalent

Johan Löfberg

Examiner

Fredrik Gustafsson

Course website and other links

<http://www.control.isy.liu.se/student/tsrt78/>

Education components

Preliminary scheduled hours: 57 h

Recommended self-study hours: 103 h

Course literature

Additional literature

Books

Common rules

Regulations (apply to LiU in its entirety)

The university is a government agency whose operations are regulated by legislation and ordinances, which include the Higher Education Act and the Higher Education Ordinance. In addition to legislation and ordinances, operations are subject to several policy documents. The Linköping University rule book collects currently valid decisions of a regulatory nature taken by the university board, the vice-chancellor and faculty/department boards.

LiU's rule book for education at first-cycle and second-cycle levels is available at http://stydokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva.