Offered by
ICT Engineering

IT-DSP1

1.1

Digital Signal Processing

ECTS
5

Prerequisites
Upper level mathematics equivalent to A-levels

- CAL I1

Main purpose
The purpose of the course is to equip the student with basic knowledge about the fundamentals of Digital Signal Processing and its applications.

Starting from the basic definition of a discrete-time signal, we will work our way through sampling, filter design, and Fourier analysis to build a basic DSP toolset. Signal processing is one of the fundamental theories and techniques to construct modern information systems. For example, audio, speech, and image processing, computer graphics, biomedicine all apply digital signal processing. In fact, digital signal processing is used to develop algorithms that can diagnose heart disease and can even be used to detect hostile drones. The course familiarizes the student with digital signals, sampling theory, digital filtering, the Fast Fourier Transform, power spectrum, and feature extraction.

Knowledge
After successfully completing the course, the student will have gained knowledge about:

- The nature and recording of different types of digital signals
- Cleaning up digital signals
- Extracting useful values from digital signals
- MATLAB as a tool for development of signal processing algorithms

Skills
After successfully completing the course, the student will be able to:

- Record digital signals
- Apply different filters (high-pass, low-pass, band-pass, notch) to remove unwanted components of digital signals
- Use the Fast Fourier Transform to analyze the frequency content of a signal

Competences
After successfully completing the course, the student will have acquired competences in:

- Explain sampling processes and how to determine the correct sampling frequency
- Describe signal processing applications
- Applying digital signal processing methods to analyze and interpret engineering problems
- Develop signal processing algorithms

Topics

- What is a signal?
- MATLAB
- Sampling theory
- A/D conversion
- Digital filters
- The frequency domain
- The Fast Fourier Transform and power spectrum
- Feature extraction (RMS, AUC, peak detection, peak latency, peak to peak, time intervals)

Teaching methods and study activities
Approximately 150 hours. The course is a mixture of lectures, hands-on MATLAB exercises, and hand-ins with approximately 1/3 of the time devoted to each part. Exercises are carried out in teams of 2-3 students.

Study Activity Model

Resources
Mark Owen - Practical Signal Processing © Cambridge University Press (ISBN 978-1-107-41182-1).
The MATLAB software will be integrated into this course.

Evaluation
The course is evaluated via an oral exam after course completion.

Grading will be done according to teh 7-scale, using an internal examiner.

Examination

At the end of the semester, the students will hand-in an assignment and the final exam will be based on this assignment.

The students will present the assignment in the form of a demonstration, followed by questions about the signal processing and feature extraction methods as well as the MATLAB programming.

Grading criteria
According to the 7-point grading scale.

Internal examiner.

Mark 12:
Awarded to students who have shown excellent comprehension of the above-mentioned competences. A few minor errors and shortfalls are acceptable.

Mark 02:
Awarded to students for the just acceptable level of comprehension of the required competences.

Additional information
For more information, please contact Line Lindhardt Egsgaard (lile@via.dk).

Responsible
Line Lindhardt Egsgaard

Valid from
1.1.2017

Course type
ICT Engineering;6. semester;7. semester;Elective for the specialization Business Information Systems;Elective for the specialization Cross Media;Elective for the specialization Enterprise Engineering;Elective for the specialization Web Engineering;Elective for the specialization Embedded Engineering;Electives;

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