

# Data Compression

Programme course

6 credits

Datakompression

TSBK08

Valid from: 2022 Spring semester

**Determined by**

Board of Studies for Electrical Engineering,  
Physics and Mathematics

**Date determined**

2021-09-01

## Main field of study

Electrical Engineering, Media Technology and Engineering

## Course level

Second cycle

## Advancement level

A1X

## Course offered for

- Master of Science in Computer Science and Engineering
- Master of Science in Industrial Engineering and Management
- Master of Science in Information Technology
- Master of Science in Computer Science and Software Engineering
- Master of Science in Applied Physics and Electrical Engineering
- Master of Science in Industrial Engineering and Management - International
- Master of Science in Applied Physics and Electrical Engineering - International
- Master's Programme in Communication Systems

## Prerequisites

Probability theory

## Intended learning outcomes

After having taken this course, the student is expected to be able to

- Obtain a random model for a source, given data from the source.
- Analyze random sources and calculate theoretical limits for coding performance.
- Understand and explain the concept of codes.
- Understand and explain how the following coding methods work
  - Huffman coding
  - Golomb coding
  - Arithmetic coding
  - Lempel-Ziv coding
  - Burrows-Wheeler's block transform

- Understand and explain how adaptive Huffman coding and adaptive arithmetic coding works.
- Design different types of coders and calculate their coding performance, given random source models.
- Know where the coding methods are used in different standards.
- Implement different coding methods, test these on real data and report the results in writing.

## Course content

The course deals with coding and data compression from an information theoretic perspective. Subjects:

- Random models for sources
- Source coding theory
- Entropy
- Huffman coding
- Arithmetic coding
- Lempel-Ziv coding
- Burrows-Wheeler's block transform
- Adaptive coding methods
- Coding standards
- Fax coding
- Lossless image coding

## Teaching and working methods

The course consists of lectures, lessons and laboratory work.

## Examination

LAB2	Small computer project	U, G	2 credits
TEN1	A written exam	U, 3, 4, 5	4 credits

During the project, the students implement a couple of the coding methods that are taught in the course and test them on several kinds of real data. The students can choose to work alone or in groups of two.

## Grades

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

## Other information

Supplementary courses: Image and Audio Coding

### **About teaching and examination language**

The teaching language is presented in the Overview tab for each course. The examination language relates to the teaching language as follows:

- If teaching language is “Swedish”, the course as a whole could be given in Swedish, or partly in English. Examination language is Swedish, but parts of the examination can be in English.
- If teaching language is “English”, the course as a whole is taught in English. Examination language is English.
- If teaching language is “Swedish/English”, the course as a whole will be taught in English if students without prior knowledge of the Swedish language participate. Examination language is Swedish or English depending on teaching language.

### **Other**

The course is conducted in a manner where both men's and women's experience and knowledge are made visible and developed.

The planning and implementation of a course should correspond to the course syllabus. The course evaluation should therefore be conducted with the course syllabus as a starting point.

If special circumstances prevail, the vice-chancellor may in a special decision specify the preconditions for temporary deviations from this course syllabus, and delegate the right to take such decisions.

## Department

Institutionen för systemteknik

## Director of Studies or equivalent

Lasse Alfredsson

## Examiner

Harald Nautsch

## Course website and other links

## Education components

Preliminär schemalagd tid: 48 h  
Rekommenderad självstudietid: 112 h

## Course literature

Kursen har inte någon hårt specificerad kurslitteratur. För den som även tänker läsa TSBK02/06 Bild- och ljudkodning rekommenderas den kursens huvudlitteratur: Khalid Sayood, "Introduction to Data Compression", Morgan Kaufmann Publishers, ISBN 978-0-12-415796-5