FEO3210 Information Theory 12.0 credits

Informationsteori

This is a translation of the Swedish, legally binding, course syllabus.

Establishment

Grading scale

G

Education cycle

Third cycle

Specific prerequisites

Mandatory Prerequisites

- Signals and systems corresponding to EQ1100 “Signaler och System”
- Stochastic processes and signal theory corresponding to EQ1220 “Signalteori”

Recommended

- Digital communications corresponding to EQ2310 “Digital Communications”

Language of instruction

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

Intended learning outcomes

After the course, the student should be able to:

- describe the general principles of information theory
- explain fundamental concepts such as entropy, mutal information, capacity, compression, coding theorem, coding and codes, basic algebraic coding theory
- formulate and prove the most fundamental coding theorems
- design a linear code that meets given requirements on rate and minimum distance
- explain how information theory and coding contributes to modern communications technology
- solve advanced problems in the area
- do research using tools from information theory

Course contents

entropy and mutual information, the asymptotic equipartition principle, entropy for stochastic processes (entropy rate), introduction to data compression and source coding, channel capacity and coding for noisy channels, capacity for different channel models (with emphasis on discrete memoryless channels and Gaussian channels), finite field theory, design and analysis of error correcting codes (with a focus on linear block codes), introduction to network information theory

Disposition

Lectures, homework problems, presentation/review of a journal paper in the field

Course literature

· Main textbook: ”Elements of Information Theory,” Second. Ed., by T. Cover and J. Thomas (Wiley 2006: ISBN 0-471-24195-4).

· Second textbook: ”Introduction to Coding Theory,” R. M. Roth (Cambridge 2006: ISBN 0-521-84504-1)

Examination

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.

If the course is discontinued, students may request to be examined during the following two academic years.

Other requirements for final grade

The main focus is on homework problems. Each assignment (set of homework problems) will be graded according to (thresholds given are approximate):

-1: less than 5% of assignment solved correctly

0: between 5% and 40% of assignment solved correctly

1: between 40% and 80% of assignment solved correctly

2: more than 80% of assignment solved correctly

There are 11 assignments in total, and the threshold for receiving grade ”Pass” is 15 points. An additional requirement to receive grade ”Pass” is to review and present a journal paper in the field.

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.