FEO3200 Foundations in Digital Communications 12.0 credits

Teori för digital kommunikation

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

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

Establishment

Course syllabus for FEO3200 valid from Autumn 2012

Grading scale

Education cycle

Third cycle

Specific prerequisites

Mandatory prerequisite for this course is the basic course on digital communications

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

1. explain and derive the foundation of digital communication methods,

2. acquire and discuss results related research literature,

3. solve standard problems in detection, modulation, and estimation theory,

4. use the advanced theoretical tools to analyze and design new procedures adapted

to specific problems.

Course contents

In the first part of the course the following topics are covered:

- A rigorous revisit of basic principles in digital communication,
- Stochastic processes and stationary discrete-

time stochastic processes,

- Binary and multi-

hypothesis testing problem, sufficient statistics

- Parallelism to estimation theory, composite detection problem
- Uni-and multivariate Gaussian distribution, complex Gaussian and circular symmetry
- Continuous-time stochastic processes
- Detection in white Gaussian noise
- Non-coherent detection and nuisance parameters

In the second part of the course the following topics are covered:

- Signal detection in discrete time: Performance evaluation of procedures, e.g., Chernoff bound, sequential detection, non parametric and robust detection
- Elements of signal estimation
- Signal Detection in continuous time: The detection of deterministic and partly determined signals in Gaussian noise and the detection of random signals in Gaussian noise

Disposition

Lecture, homework problems, exercise seminars, presentation of problem solutions or

selected paper.

Course literature

The first part of the course uses

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A Foundation in Digital Communications

by A. Lapidoth.

The second part of the course uses

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Quickest Detection

by H. V. Poor and O. Hadjiliadis.

Complementary literature

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Detection, Estimation, and Modulation Theory, Part I

by H. L. van Trees.

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An Introduction to Signal Detection and Estimation

by H. V. Poor.

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An Introduction to Statistical Communication Theory

by D. Middleton.

If more suitable course literature is available, then the course literature is possibly changed. Therefore please visit the course homepage where the final decision on the course literature will be announced before the course starts.

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.

Other requirements for final grade

To pass the course the student

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has to hand in every homework. For each homework a minimum number of points must be achieved as well as the sum of all achieved points has to exceed a threshold, and

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has to sign up for presentation of at least one exercise solution for every homework set and has to present successfully at least one solution in one exercise seminar. Those who did not successfully present have to do a presentation of a selected paper.

The thresholds will be adjusted according to the number of achievable points and will be fixed before the course starts.

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.