EQ1270 Stochastic Signals and-Systems 6.0 credits

Stokastiska signaler och system

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

On 04/15/2021, the Head of the EECS School has decided to establish this official course syllabus to apply from autumn semester 2021, registration number. J-2021-0510.

Grading scale

A, B, C, D, E, FX, F

Education cycle

First cycle

Main field of study

Technology

Specific prerequisites

Knowledge in signals and systems in continuous time, 6 higher education credits, equivalent to completed course EQ1110.

Knowledge in signals and systems in discrete time, 6 higher education credits, equivalent to completed course EQ1120.

Active participation in a course offering where the final examination is not yet reported in LADOK is considered equivalent to completion of the course. Registering for a course is counted as active participation. The term 'final examination' encompasses both the regular examination and the first re-examination.

Language of instruction

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

Intended learning outcomes

A student who has passed the course should be able to:

- Show basic understanding of properties of stochastic processes.
- Analyse given issues in estimation or optimal filtering.
- Apply mathematical modelling on problems in electrical engineering.
- Demonstrate an understanding of sampling and reconstruction of weakly stationary stochastic processes.
- Develop simple programme code, e.g., by means of the tool Matlab, and use this code to simulate and analyse problems in the area, and report the implementation and the result.
- Use a given or individually formulated mathematical model for solving a given technical problem in the area and analyse the result and its plausibility.

A student who has completed the course with higher grades should in addition to the aims that apply to pass be able to:

- Show good understanding of properties of stochastic processes.
- Analyse given issues in filtering, sampling and reconstruction of weakly stationary stochastic processes.
- Analyse given issues in estimation and optimal filtering.
- Formulate mathematical models that are applicable and relevant at a given problem in the area. When it is missing explicitly given information in the problem, the student should be able to assess and compare different possibilities and make reasonable own assumptions to achieve an adequate modelling.
- Use a given or individually formulated mathematical model for solving a problem in the area e.g. problems that are built-up of several interacting partial problems or such that require more advanced mathematical modelling, and analyse the result and its plausibility.

Course contents

The course gives a broad introduction to modelling by means of stochastic processes in electrical engineering applications. Problem formulation with mathematical models is an important part of the course.

Basic about time continuous and discrete-time stochastic processes, especially weakly stationary. Definitions such as distribution and density functions, expectation, mean power,

variance, autocorrelationfunction, spectral density.Gaussian processes and white noise. Linear filtering of stochastic processes.

The notion of ergodicity: Estimation of the properties of processes from measurements.

Sampling and reconstruction: Transformation between continuous-time and discrete-time signals. Effect of sampling. Sampling theorem. Pulse amplitude modulation. Errors at reconstruction of stochastic signals.

Estimation theory: Linear estimation and the ortogonality principle. Prediction and Wiener filter. Model-based signal processing: Linear signal models, AR models. Spectral estimation.

Application of the above on simple electrotechnical applications.

Examination

- PRO1 - Project Work, 1.0 credits, grading scale: P, F
- PRO2 - Project Work, 1.0 credits, grading scale: P, F
- TEN1 - Exam, 4.0 credits, grading scale: A, B, C, D, E, FX, F

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.

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.