Stochastic signals 7.5 credits S7001E

Stokastiska signaler

Course syllabus admitted: Autumn 2023 Sp 1 - Present

DECISION DATE
2021-02-16

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Stochastic signals 7.5 credits S7001E

Stokastiska signaler

Second cycle, S7001E

Education level	Grade scale	Subject	Subject group (SCB)
Second cycle	G U 3 4 5	Signalbehandling	Computer Technology

Main field of study

Maintenance Engineering, Computer Science and Engineering

Entry requirements

Upper secondary education and documented skills in English language, including the following knowledge/courses: S0001E Signal analysis, S0008M Probability Theory and Statistics, or equivalent.
Good knowledge in English equivalent to English 6.

Selection

The selection is based on 30-285 credits

Course Aim

After completion of the course, the students shall be able to:

Use mathematical and statistical methods to process random signals, disturbances and noise. Estimate random parameters, estimate signals and parameters in noise, separate randomly composed signals, calculate the estimation error, calculate the statistical outcome of linear systems on random signals, develop detectors for signals in noise, calculate and estimate the spectral content in random signals. The students shall be able to implement, evaluate, and analyze these concepts in Matlab, and be able to present and demonstrate their results in written group reports.

Contents

Applications of stochastic signals can be found in many different areas such as electrical engineering, signal processing, image analysis, communications theory, control theory, measurement systems, medicine, economics.

After completion of the course, the students shall have knowledge and understanding concerning:

• Random Variables, Functions of Random Variables, Cumulative Distributions Functions, Probability Density Functions
• Expectations and Moments, Random Vectors, Central Limit Theorem
• Parameter Estimation, Maximum Likelihood Estimation, Linear Estimation
• Minimum Mean Squared Error (MMSE) Estimation, Linear MMSE Estimation, Statistical Orthogonality,
• Bayesian Decision Theory, Hypothesis Testing and Detection, Likelihood Ratio Test,
• Random Sequences, Random Processes, Stationarity
• Autocorrelation, Cross-correlation
• Linear Time Invariant Systems and Wide Sense Stationary Sequences and Processes, Filtering of Stochastic Signals
• Power Spectral Density, White Noise
• Ergodicity, Wiener Filter, Spectral Estimation

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Realization

Each course occasion´s language and form is stated and appear on the course page on Luleå University of Technology's website.

Lectures, problem solving and mandatory laboratory assignments.

Examination

If there is a decision on special educational support, in accordance with the Guideline Student's rights and obligations at Luleå University of Technology, an adapted or alternative form of examination can be provided.

Written exam with differentiated grades and successful completion of the laboratory assignments. At the written examination the students shall be able to demonstrate good problem-solving skills concerning the aforementioned course aims.
All practical laboratory assignments must be completed to pass the course, but the final grade of the course is set by the result on the written exam.

Unauthorized aids during exams and assessments

If a student, by using unauthorized aids, tries to mislead during an exam or when a study performance is to be assessed, disciplinary measures may be taken. The term "unauthorized aids" refers to aids that the teacher has not previously specified as permissible aids and that may assist in solving the examination task. This means that all aids not specified as permissible are prohibited. The Swedish version has interpretative precedence in the event of a conflict.

Overlap

The course S7001E is equal to SMS029

Course offered by

Department of Computer Science, Electrical and Space Engineering

Modules

Code	Description	Grade scale	Cr	Status	From period	Title
0002	Laboratory work	U G#	1.5	Mandatory	A07	
0003	Written exam	G U 3 4 5	6	Mandatory	A21	

Study guidance

Study guidance for the course is to be found in our learning platform Canvas before the course starts. Students applying for single subject courses get more information in the Welcome letter. You will find the learning platform via My LTU.

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Last revised

by Jonny Johansson, HUL SRT 2021-02-16

Syllabus established

by the Department of Computer Science and Electrical Engineering 2007-02-28

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