FIK3617 Probability and Stochastic Processes for Engineering Applications 9.0 credits

Sannolikhets och stokastiska processer för ingenjörstillämpningar

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

Establishment

Course syllabus for FIK3617 valid from Spring 2016

Grading scale

G

Education cycle

Third cycle

Specific prerequisites

The course is a first year doctoral course

Basic university level course in probability and statistics.

Language of instruction

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

Intended learning outcomes

The course is a first graduate (PhD) course in probability and stochastic processes. The course aims at providing the student with a good review of probability theory, and random variables. The course then has its focus on stochastic processes with special attention on applications in wireless communication and signal processing.
After the course the student should be able to:
- model signals and phenomena in a probabilistic manner.
- optimize performance in statistical terms.
- use analytical tools that are useful in the study of stochastic models that appear in wireless communications and other engineering fields.
- predict system performance using statistical reasoning, and verify it using numerical methods.

Course contents

Review of Basic Probability: Probability spaces, random variables, distribution and density functions, expectation, characteristic functions, conditional probability, conditional expectation.
Sequences of Random Variables: Convergence concepts, laws of large numbers, central limit theorem.
Basic Concepts of Stochastic Processes: General concepts, types of stationarity, properties of stochastic processes, systems with stochastic inputs.
Random Processes in Linear Systems: Spectral analysis of random processes in linear systems, spectral representation and Fourier transforms.
Special Processes: Markov processes, Wiener Process, Poisson processes, shot noise, thermal noise.
Spectral Representation of Random Processes: White-noise integrals, expansion of random processes
Applications: Signal detection and parameter estimation

Disposition

The course is a self-study course with weekly meetings where, solutions to homework problems are reviewed by the students. For each session, a “teacher on duty” is assigned that can help if problems arise. Every student should submit his/her solutions to the “teacher on duty” prior to the meeting. During the meeting the students take turns to present their solution to the problems of the week. If problems occur, e.g. no student is able to come up with a solution or if serious doubts regarding any solution remain, the students should call on the “teacher on duty”.

Course literature

Davenport, “Probability and Random Processes”, McGraw-Hill 1970, Classic textbook reissue 1987

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.

Pass/Fail

Other requirements for final grade

To pass the course you need to correctly solve 75% or more of the homework problems, or written final exam.

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.