GÖTEBORG UNIVERSITY **COURSE PLAN MSG860**
Faculty of Sciences
Mathematical Sciences

MSG860, BASIC STOCHASTIC PROCESSES F, 5 credit points

Level: undergraduate

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1. Authorisation.

The course plan has been authorised by the vice-dean of the Department of Mathematical Sciences on November 9, 2006, to be valid from July 1, 2007.

Educational field: Mathematical Sciences

2. Educational context.

The course is part of the Bachelor Program in Mathematical Sciences and is also open for students outside the program who meet the course prerequisites. In addition, the course is intended to be suitable for graduate students from other fields in science.

3. Prerequisites.

Undergraduate experience of probability theory, such as an undergraduate course in mathematical statistics. Students with a good mathematical background might not need a probability background - please contact the examiner for advice.

4. Goals and learning outcomes.

Calculus, including integration, differentiation and differential equations are of fundamental importance for modelling in most branches on natural sciences. However, these tools are insufficient to model a large number of phenomena which include "chance" or "uncertainty". Examples of such phenomena are noise disturbances of signals in engineering, uncertainty about future stock prices in finance, and the macroscopic result of many microscopic random particle movements in natural sciences. Among the most important tools required for the modelling of the latter phenomena are stochastic processes. The course gives a solid basic knowledge of stochastic processes, intended to be sufficient for applications on undergraduate and masters levels in engineering and natural sciences, as well as for selected applications on graduate level. It is a also perfect base for more advanced studies of stochastic processes, such as in the course MSF200 Stochastic Processes.

An advanced and axiomatic treatment of the theory of stochastic processes relies on probability theory and mathematical analysis. The purpose of the course is to give a more applied treatment of stochastic processes, in part by means of applications and examples. Hence students need not worry about probability and mathematical background, and it is possible to cover more ground in stochastic processes than if more effort were spent on background knowledge and mathematical rigour.

5. Course description.
What is a stochastic process? Elements of time series with random walks. Brownian motion and elements of diffusions. Independent increment processes. Gaussian processes. Stationarity and weak stationarity. Elements of continuous time Markov chains and Queues. Elements of filtering and forecasting.

6. Literature.
To be determined.

7. Assessment.
Written final examination which coincides with the midterm examination of the course MSG800 Basic Stochastic Processes, 7.5 credit points.

8. Grades.
The grade levels are Fail (U), Pass (G), and High Pass (VG). A wish for an ECTS grade should be reported to the examiner at the beginning of the course.

9. Course evaluation.
During the course the teachers arrange a get-together with the students, to get feedback on the results so far. At the end of the course the students will be asked to answer a questionnaire, the results of which will be processed by the teachers together with student representatives.

10. Additional information.
The course is given in English. The course coincides with the first two thirds of the course MSG800 Basic Stochastic Processes, 7.5 credit points. At the end of the course it is possible to continue to fulfill the requirements of the larger course MSG800. A more advanced and axiomatic treatment of stochastic processes is given in the course MSF200 Stochastic Processes. A treatment of stochastic processes with a special focus on signal processing in electrical engineering is given in Random Processes with Applications.