# Time Series Analysis 2017

**Introductory meeting and start of course**
The introductory meeting takes place on Monday, October 30, 2017, at 13.15, in Kårhusets Hörsal.

Lectures are held Mondays and Wednesdays 13–15. Exercises are held Thursdays and Fridays; see the webpage for details. There are office hours as given on the webpage; without appointment, please respect these.

**Course overview**
Course credits: 7.5 hp.

The course is a project course, containing lectures, computer exercises and an independent project with both oral and written presentation. Computer exercise 1–3 are mandatory, whereas exercise 0 is voluntary and done on your own.

**Course content**
Time series analysis deals with the modelling of stochastic systems, such as the air temperature, the price and demand of electricity, radar signals, EKG or option pricing on the stock market. The model structure is chosen partly from knowledge of the physical system, and partly by examining observed data measurements. Central problems are, for instance, the predictability of the model, how to estimate the model parameters in a robust way, estimation of the spectral content of the model, or other non-parametric descriptions of the system, as well as validation of the chosen model, i.e., how one should ensure that the model well describes the observed measurements.

**Course literature**
Andreas Jakobsson, ”An Introduction to Time Series Modeling”, 2 ed., Studentlitteratur, 2015.

**Examination**
The course examination consist of mandatory computer exercises, hand-ins, as well as a project. As a part of the examination, a detailed project report should be handed in, as well as the result disseminated in an oral presentation. Project examination will take place on **20/12**, at 10-12, or on **12/1**, at 13-16 (choose either of the times). The take-home exam will be available at 12.00 on 8/1. The exam is due on **15/1**, at 13.15.

The project report and the presentation material should be handed in no later than at the start of the presentation. Printed versions of the project report and the take home should be handed in to the course secretary. Make sure you staple and put your name on the hand-in! The slides for the presentation may be mailed as a pdf to the lecturer directly.

**Teaching staff**


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## Preliminary schedule

**Week 1**

Lect 1 Introduction and overview. Multivariate random variables.
Lec 2 Multivariate random variables. Stochastic processes.
Reading instructions: Ch. 1, 2, 3.1-3.3
Problems: 2.1, 2.2, 2.3, 3.1-3.4

**Week 2**

Lect 3 Stochastic processes.
Lect 4 Stochastic processes. Identification.
Reading instructions: Ch. 3, 4.1-4.2
Problems: 3.5-3.10, 3.12-3.15

**Week 3**

Lect 5 Identification.
Lect 6 Estimation.
Reading instructions: Ch. 4, 5.1-5.2
Problems: 4.1-4.4

**Week 4**

Lect 7 Model order selection.
Lect 8 Residual analysis.
Reading instructions: Ch. 5
Problems: 5.1-5.5, 5.8, 5.10-5.11

**Week 5**

Lect 9 Prediction.
Lect 10 Multivariate time series.
Reading instructions: Ch. 6, 7
Problems: 6.1-6.8

**Week 6**

Lect 11 Recursive estimation. State-space models.
Lect 12 The Kalman filter. Project discussion.
Reading instructions: Ch. 8
Problems: 7.1-7.4, 8.1-8.2

**Week 7**

No lecture this week.
Problems: 8.3-8.8

**Computer exercises** The computer exercises take place during week 47–49. See the webpage for details.

**Web** Material and news related to the course can be found at:
`http://www.maths.lth.se/matstat/kurser/fms051mas216/`