



**Random graphs and network statistics**  
MS-E1995, Periods IV–V, 5 cr  
Lecturer: Lasse Leskelä

In this course you will become familiar with key statistical models used to describe social, biological and technological networks, and learn their mathematical foundations within the theory of large random graphs. The course is targeted for students in mathematics, operations research, and computer science, with interest in probability, graphs, and networks.

**Heavy-tailed distributions**  
MS-E1992, Period II, 5 cr  
Lecturer: Matias Heikkilä

Extreme value theory studies properties of heavy-tailed distributions and provides tools for practical tasks such as risk analysis. This course is a basic overview of extreme value theory and provides you with the prerequisites for understanding the methodology and pursuing more advanced topics in the field.

**Large random systems**  
MS-E1602, Next time in Spring 2019, 5 cr

**Brownian motion and stochastic analysis**  
MS-E1601, Period IV, 5 cr  
Lecturer: Kalle Kytölä

Brownian motion is a fundamentally important stochastic process, discovered in the contexts of financial markets and statistical physics. It relates to diverse mathematical topics from partial differential equations to constructive quantum field theory. This course introduces you to key techniques for working with Brownian motion, including stochastic integration, martingales, and Itô's formula.

**Multivariate statistical analysis**  
MS-E2112, Periods III–IV, 5 cr  
Lecturer: Pauliina Ilmonen

This course introduces you to common multivariate data analysis techniques. You will also learn to apply these methods in practice using R programming. Course topics include multivariate location and scatter, principal component analysis, multivariate correspondence analysis, canonical correlation analysis, discriminant analysis, classification, and clustering.

**Probability theory**  
MS-E1600, Period III, 5 cr  
Lecturer: Kalle Kytölä

This course introduces you to the mathematical theory of randomness. You will learn to work with probabilistic concepts such as stochastic independence, convergence of random sequences, information contained in a sigma-algebra, characteristic and generating functions of probability measures, laws of large numbers, and central limit theorems.

**Ennustaminen ja aikasarja-analyysi**  
MS-C2128, Periodi II, 5 op  
Luennoitsija: Lauri Viitasaari

Kurssin tavoitteena on oppia analysoimaan ja ennustamaan tilastollisia aikasarjoja. Kurssin sisältöön kuuluvat lineaariset mallit ja regressiodiagnostiikka, stationaaristen prosessien keskeiset käsitteet, erilaiset ARIMA-mallit, Kalmanin suodin sekä johdatus dynaamisiin regressiomalleihin. Kurssin laskuharjoituksissa käytetään R-ohjelmistoa.

**Euklidiset avaruudet**  
MS-C1540, 5 op

**Stokastiset prosessit**  
MS-C2111, Periodi I, 5 op  
Luennoitsija: Kalle Kytölä

Kurssilla tutustutaan stokastisten prosessien eli ajasta riippuvien satunnaisilmiöiden teoriaan ja opitaan analysoimaan ja mallintamaan mm. tieteen ja tekniikan populaatiomalleja Markov-prosessien avulla, ennakoimattomia tapahtumahetkiä Poisson-prosessin avulla, sekä uhkapelejä ja sijoitusstrategioita martingaalien avulla.

**Introduction to statistical inference**  
MS-C2104, Periods III–IV, 5 cr  
Lecturer: Pauliina Ilmonen

This course is an introduction to statistical analysis and statistical inference. Course topics include estimation, simple parametric and nonparametric tests, statistical dependence and correlation, linear regression analysis and analysis of variance. R programming is used in the exercises.

**Todennäköisyyslaskennan ja tilastotieteen peruskurssi**  
MS-A050X, Periodit I, II, III, IV, 5 op  
Luennoitsija: Lasse Leskelä et al.

Kurssilla opitaan laskemaan satunnaisiin tilanteisiin liittyviä todennäköisyyksiä ja odotusarvoja joukkojen, summien ja integraalien avulla. Lisäksi tutustutaan tilastollisiin menetelmiin, joiden avulla voi laatia estimoitteja ja ennusteita sekä analysoida tilastollista merkitsevyyttä havaitun datan ja prioritiedon valossa.

**Introduction to R programming**  
MS-E1994, One-weekend intensive course, 1 cr  
Lecturers: Marko Voutilainen, Sami Helander

This course gets you started with R programming. No prior programming experience is required.

**Matriisilaskenta**  
MS-A000X, 5 op

**Differentiaali- ja integraalilaskenta 1**  
MS-A010X, 5 op

Interested in writing a BSc, MSc, or PhD thesis in stochastics and statistics?  
→ Contact Pauliina Ilmonen, Kalle Kytölä, or Lasse Leskelä

Obtain credit points by participating in the MS-E1609 Stochastics and statistics seminar?  
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