

Courses

Courses and seminars

Summer School DYNAMICS OF INFECTIOUS DISEASES

The Helsinki Summer School on Mathematical Ecology and Evolution 2014 - an EMS-ESMTB Summer School in Applied Mathematics

This edition of the summer school specializes on the dynamics of infectious diseases. More information [here](#).

Biomathematics Day 11

A full-day seminar on Wednesday 23 October 2013, in Kumpula, Exactum. More information: <http://mathstat.helsinki.fi/research/biomath/> -> Biomathematics Days.

Dynamics Day, 9 October 2013

The Finnish Centre of Excellence in Analysis and Dynamics Research arranges a one day meeting devoted to different aspects of dynamical systems on Wednesday October 9, 2013 in the Exactum Building of the Kumpula Campus of the University of Helsinki. Everybody is cordially invited to attend!

Preliminary program:

Morning session (room D123) 10 - 12

10.15 - 11.00 Mikko Stenlund (University of Helsinki): TBA

11.15 - 12.00 Chun Fang (University of Helsinki): Central dimension one minimal sets for tridiagonal competitive-cooperative systems

Afternoon session (room C123) 14-16

14.15 - 15.00 Janusz Mierczynski (Wroclaw University of Technology): Estimates of Principal Lyapunov Exponents

15.15 - 16.00 Yi Wang (University of Science and Technology of China, Hefei): TBA

This program is directly followed by the regular post-doc seminar (in room CK112),

16.15 - 17.00 Neil Dobbs (University of Helsinki): TBA

Centre of Excellence in Analysis and Dynamics Research special event June 2013

[Luca Peliti](#) (University of Naples) will lecture a short course on

"*Statistical Physics Approach to the Mechanisms of Evolution*"

Timetable:

Mon 03.06 h. 10-12 in D123: [The Mechanisms of Evolution I](#)

Tue 04.06 h. 10-12 in D123: [The Mechanisms of Evolution II](#)

Wed 05.06 h. 10-12 in D123: [Statistics of Genealogies](#)

Thu 06.06 h. 10-12 in D123: [The Speed of Adaptation in Large Populations](#)

Fri 07.06 h. 10-12 in D123

Biomathematics Day 10

A full-day seminar on Wednesday 15 May 2013, in Kumpula, Exactum.
More information: <http://mathstat.helsinki.fi/research/biomath/> -> Biomathematics Days.

Centre of Excellence in Analysis and Dynamics Research special event January 2013

[Jérémie Unterberger](#) (Henri Poincaré University, Nancy) will lecture a short course on

"An introduction to rough path theory. At the crossroads between stochastic calculus and renormalization theory" ([Abstract](#))

Timetable:

Mon 21.01 h. 14-16 in C123
Tue 22.01 h. 14-16 in C123
Wed 23.01 h. 14-16 in C123
Thu 24.01 h. 14-16 in C123
Fri 25.01 h. 14-16 in C123

Intensive-course on "*Spaces of Entire Functions in Spectral Problems*" by Alexei Poltoratskin

[Alexei Poltoratskin](#) (Texas A&M University) will lecture a one week course

Timetable

Tuesday 13.11. 14-16 D122
Wednesday 14.11. 14-16 D123
Thursday 15.11. 14-16 D122
Friday 16.11 14-16 C124

Abstract:

The Krein - de Branges theory of Hilbert spaces of entire functions was introduced around mid 20th century to treat spectral problems related to differential operators and canonical systems.

Since then, the theory has become a fundamental part of spectral and complex analysis. It was applied in numerous important problems, e.g. Marchenko's proof of the uniqueness of the inverse spectral problem for Schroedinger operators. The course covers the basics of the theory, its connections with other branches of complex and harmonic analysis and recent applications.

Biomathematics Day 9

A full-day biomathematics seminar on Wednesday 14 May 2012, in Kumpula, Exactum. Program and venue: [pdf](#). Registration by email to eva.kisdi@helsinki.fi.

Intensive-course on "*Fluctuation relations in stochastic thermodynamics*" by Krzysztof Gawdzki

Krzysztof Gawdzki (Laboratoire de Physique ENS de Lyon)
will lecture a one week course

Timetable

Mon 05.11 at 14 in D122, Lecture 1 : Transient fluctuation relations for Markov processes.

Tue 06.11 at 14 in D122, Lecture 2: 2nd Law of Stochastic Thermodynamics.

Thr 08.11 at 14 in D122, Lecture 3: Fluctuation-dissipation relations.

Fri 09.11 at 14 in CK107, Lecture 4: Stationary fluctuation relations for large deviations.

Abstract:

Nonequilibrium statistical mechanics aims at a statistical description of closed and open dynamical systems of large dimension. Fluctuation relations are robust identities concerning the statistics of entropy production or performed work in such systems. They are expected to

hold arbitrarily far from thermal equilibrium.

The lectures present a self contained mathematical introduction to fluctuation relations in the setup of finite-dimensional diffusion processes.

Crash-course on "*Some topics in random matrices and conformal field theory*" by Nikolai Makarov

Nikolai Makarov (CalTech)

will give an intensive course on "*Some topics in random matrices and conformal field theory*"

The lectures are Monday-Friday 28.5-1.6 each day 13-15 in room D123.

Biomathematics Day 8

A full-day biomathematics seminar on Wednesday 18 April 2012, in Kumpula, Exactum. Program and venue: [pdf](#). Registration by email to eva.kisdi@helsinki.fi.

Crash-course on "*Directed Polymers Models*" by Timo Seppäläinen

Timo Seppäläinen (University of Wisconsin)

will give an intensive course on DIRECTED POLYMER MODELS

January 9-11, 14-16, lecture room D123

Lecture 1. 9.1. 2012 14-16

Weak and strong disorder in directed polymer models

Introduction to the $d+1$ dimensional directed polymer model (warning: no connection with polymer physics!). Martingale techniques for proving a central limit theorem in high temperature and localization in the so-called strong coupling regime (low temperature or $d=1,2$). The expected KPZ behavior in $1+1$ dimensions.

Lecture 2. 10.1. 2012 14-16.

The Burke property in $M/M/1$ queues and directed polymer models

The Burke, or output theorem, is a fundamental result for memoryless queues. An analogous property is valid for special exactly solvable $1+1$ dimensional polymer models in both zero and positive temperature. This property furnishes a start for proofs of fluctuation exponents.

Lecture 3. 11 .1. 2012 14-16.

The exactly solvable log-gamma polymer

Results for the $1+1$ dimensional log-gamma polymer that follow from the Burke property. A combinatorial approach to the log-gamma polymer through Kirillov's tropical RSK (Robinson-Schensted-Knuth) correspondence.

Summer School on Mathematical Ecology and Evolution 2012, THEORY OF SPECIATION

The Helsinki Summer School on Mathematical Ecology and Evolution 2012 - an EMS-ESMTB Summer School in Applied Mathematics

This edition of the summer school specializes on the theory of speciation and is partially supported by the ESF network FroSpects. More information [here](#).

Upcoming Event: Biomathematics Day 7

A full-day seminar on Wednesday 30 November 2011, in Kumpula, Exactum, room D123. More information: <http://mathstat.helsinki.fi/research/biomath/> -> Biomathematics Days.

Crash-course on "*This sets and convolutions*" by Tom Körner

[Tom Körner](#) (Cambridge University) will visit the mathematics department of the University of Helsinki Weeks 37 and 38 and will lecture the crash course

"*This sets and convolutions*"

Abstract:

We know that if we convolve a function with itself the result is smoother. But how much smoother can it be? I shall develop the tools from Fourier analysis and probability theory which enable us to attack this problem. We shall also look at, more or less, related problems on Hausdorff dimension and sets of multiplicity.

Schedule: Weeks 37 and 38, Monday 12-14, Tuesday 14-16 and Friday 12-14 (first lecture Monday 12.9 12-14, altogether 6 lectures.)

Location: D123U Exactum Building.

Minicourse on "_ Some recent connections between ergodic theory and geometric measure theory_" by Pablo Shmerkin

[Pablo Shmerkin](#) (University of Surrey) will lecture about some recent developments on the interaction between geometric and dynamical aspects of fractal sets and measures. ([Course Abstract](#))

Schedule: Monday at 14-16; all other days at 10-12

Location: University of Oulu, Department of Mathematical Sciences, (Pentti Kaiteran katu 1), lecture room M101

Contact: [Maarit Järvenpää](#) (maarit.jarvenpaa at oulu.fi)

Two lectures on "*Analysis and Singularities in Hydrodynamical Flows*" by Antonio Córdoba Barba

Monday, May the 30th at 14 in C123 (tentatively)

[Antonio Córdoba](#) (Universidad Autónoma, Madrid) :

"*Porous media: the Muskat and Hele-Shaw problems.*" ([Abstract](#))

Wednesday, June the 1st at 14 in C123

[Antonio Córdoba](#) (Universidad Autónoma, Madrid) :

"*Integral inequalities for singular integrals and formation of singularities in transport equations.*" ([Abstract \(https://wiki.helsinki.fi/download/attachments/33906781/abs-20110601.txt?version=1&modificationDate=1306414112517\)](https://wiki.helsinki.fi/download/attachments/33906781/abs-20110601.txt?version=1&modificationDate=1306414112517))

Past Course:

"Numerical bifurcation analysis" by Yuri Kuznetsov

14-18.3.2011 [Yuri Kuznetsov](#) (University of Utrecht) will lecture the short course:

"Numerical bifurcation analysis"

Time and Place

Lectures: B120 Mon-Thu 10-12 and D123 Fri 10-12

Computer labs: C128 Mon-Wed and Fri 13-14, Thu 15-16

This intensive course presents modern numerical methods and software for bifurcation analysis of parameter-dependent systems of smooth autonomous ordinary differential equations (ODEs). The main problems are: How to continue equilibria and periodic orbits with respect to a parameter? How to compute stability boundaries of equilibria and periodic orbits (limit cycles) in the parameter space? How to predict qualitative changes in system's behavior (bifurcations) occurring at these boundaries? How to locate and continue homoclinic orbits to equilibria? Only the most efficient methods will be described, which are based on projection and bordering techniques and employ boundary value problems (BVPs). These methods have been recently implemented in MATCONT, an interactive MATLAB bifurcation software for ODEs. An integral part of the course are computer sessions at which the students will learn how to use the latest version of MATCONT. No preliminary knowledge of bifurcation theory is assumed.

[Course homepage](#)

Registration by email to [Eva Kisdi](#), max 24 students

Past Course: "Random Matrices and Interacting Particle Systems"

by Patrik Ferrari

9-11.2.2011 [Patrik Ferrari](#) (University of Bonn) will lecture the short course:

"Random Matrices and Interacting Particle Systems"

Abstract:

Recently some remarkable connections have been found between the mathematical structures of on the one hand some ensembles of random matrices and on the other hand of certain interacting particle systems. The lectures give an introduction to random matrices, particle systems and their connections.

1. Lecture Wednesday 9.2. 14-16 C123

Gaussian Unitary Ensemble of random matrices (GUE): eigenvalue distribution, determinantal correlations and Hermite polynomials, interlacing structure in GUE minors.

2. Lecture Thursday 10.2. 14-16 C123

Totally Asymmetric Simple Exclusion Process (TASEP): interlacing structure in continuous time TASEP, determinantal correlations and Charlier polynomials.

3. Lecture Friday 11.2. 14-16 C123

2+1 dimensional anisotropic growth: particle dynamics, interface interpretation, dynamics on random tiling, two projections: TASEP and random tiling, diffusion scaling limit and GUE minors, discrete time and Aztec diamond.

Past Event: Biomathematics Day 5

A full-day seminar on Wednesday 24 November 2010, in Kumpula, Exactum, room D123. More information: <http://mathstat.helsinki.fi/research/biomath/> -> Biomathematics Days.

Past Course:

"An Introduction to Non-Homogeneous Harmonic Analysis" by Michael Lacey

18-22.10.2010 [Michael Lacey](#) (Georgia Institute of Technology) will lecture the short course:

"An Introduction to Non-Homogeneous Harmonic Analysis"

Time and Place

mo 18.10 10-12
tu 19.10 14-16
we 20.10 14-16
th 21.10 12-14
fr 21.10 14-16

all lectures in B120 Exactum Building

Course abstract:

Non-Homogeneous Harmonic Analysis concerns classical operators T , like Maximal Function or Hilbert transform, but studied on weighted spaces. The goal is to characterize those pairs of weights (u,v) for which T maps $L^2(u)$ to $L^2(v)$. Such questions occur naturally in a variety of settings, from analytic function spaces, to quasiconformal maps. For positive operators, like the Maximal Function, Fractional integrals, or Poisson integral, there is a complete theory. For the Hilbert transform, we have incomplete information, which nevertheless still contains beautiful results.

We will start from the beginning, with a special emphasis on dyadic methods.

Past Event: Biomathematics Day 4

A full-day seminar on Wednesday 9 June 2010, in Kumpula, Exactum, Auditorium B123. More information: <http://mathstat.helsinki.fi/research/biomath/> -> Biomathematics Days, registration (free) by email to eva.kisdi@helsinki.fi [funny character]

Past course: Summer School on Mathematical Ecology and Evolution 2010

The Helsinki Summer School on Mathematical Ecology and Evolution 2010 - an EMS Summer School in Applied Mathematics

The summer school on mathematical ecology and evolution consists of graduate-level lectures on five topics at the research frontier. More information about the summer school organized in 2010 you find [here](#).

Past Events: CoE Scientific Advisory Board meeting

20-21 May 2010 Scientific Advisory Board meeting of the Finnish Centre of Excellence in Analysis and Dynamics Talk and Event program
[Scientific Program](#)

Past course: Random Complex Zeroes and Random Nodal Lines

April 12 - 16, 2010: RANDOM COMPLEX ZEROES AND RANDOM NODAL LINES

Speaker: Mikhail Sodin (Tel Aviv)

Abstract:

We will discuss the recent progress in understanding the zero sets of two remarkable Gaussian random functions: the Gaussian entire function with invariant distribution of zeroes with respect to isometries of the complex plane, and the Gaussian spherical harmonic on the two-dimensional sphere.

The lectures are based on the results obtained in collaboration with F. Nazarov, B. Tsirelson, and A. Volberg.

Time: April 12 - 16, 2010, in the following lecture rooms:

Monday 12.4. BK107 klo 10-12.
Tuesday 13.4. BK107 klo 12-14.
Wednesday 14.4. BK107 klo 10-12.
Thursday 15.4. C124 klo 12-14
Friday 16.4 C123 klo 14-16

Past Event: special seminars by Smirnov and Beffara

Friday October the 2nd, room C124

13.30-14.30 Vincent Beffara (ENS, Lyon):
"2D statistical mechanics and random walks"
15.00-16.00 Stanislav Smirnov (Geneva): "Percolation and Black Noise".

Past Event: Biomathematics Day 3

A full-day seminar on Wednesday 28 October 2009, in Kumpula, Exactum. Program and venue: [pdf](#).
More information: tadeas.priklopil@helsinki.fi and petr.ondracek@helsinki.fi.

Past course: Monotone/Competitive dynamical systems

A short course given by Yi Wang, University of Helsinki. More information: [course website](#).

Past course: Baire Category and Probabilistic Methods in Analysis

September 7-20th 2009

[Tom Körner](#) (Cambridge University) will teach the course:
"Baire Category and Probabilistic Methods in Analysis" (Abstract)

Lectures will be held

Tuesday 8th and 15th at 10-12 in C123
Wednesday 9th and 16th at 12-14 in B120
Thursday 10th and 17th at 10-12 in C123
Friday 11th and 18th at 10-12 in B120

Course [lecture notes](#) are available for download
from Körner's web page in the section

"Notes describing my own work during the past few years"

Past Event: Jyväskylä Summer School August 2009

MA1: "Tangent of null sets, differentiability of Lipschitz functions, and other problems in geometric measure theory".

Time: 5.-13.8., 14h lectures + 4 h exercises

Lecturer: Prof. [Marianna Csörnyei](#) (University College, London)

MA2: "Percolation Theory".

Dates: 5.8-13.8, 14h lectures, 4h exercises

Lecturer: Prof. [Jeffrey Steif](#) (Chalmers University of Technology, Göteborg)

More information is available at the [Jyväskylä Summer School web page](#)

Past Event: 3rd Nordic EWM Summer School for PhD Students in Mathematics (CoE co-sponsored)

PhD students in pure mathematics, applied mathematics, mathematical statistics, mathematics education or history of mathematics are invited to participate in a summer school in mathematics organized by the European Women in Mathematics (EWM). The summer school is especially aimed at encouraging female students and researchers in their early careers, but we also want to warmly welcome male students. Students outside the Nordic countries, post-docs or advanced undergraduates thinking of PhD studies are invited to attend as well. More information: [school website](#). The school is co-sponsored by the CoE Analysis and Dynamics.

Past Event: Biomathematics Day 2

- A full-day seminar on Wednesday 29 June 2009, in Kumpula, Exactum. Program: [pdf](#); more information: [barbara.boldin\[funny character\]helsinki.fi](#). Welcome!

Past Event: Workshop on Random structures, growth processes and conformal methods.

Helsinki, Finland, March 23-26, 2009

The workshop is a joint event of the EU-research network "[CODY](#)" and the Finnish Centre of Excellence in Analysis and Dynamics Research.

The workshop is an introduction to recent advances in random structures and growth processes- areas where conformal methods are often used. There will be two mini-courses of 4.5 and 6 hours respectively followed by talks in the afternoons. The courses are given by:

[Yuval Peres](#) (Microsoft research):

Internal aggregation with multiple sources (4.5 hours, Mon-Wed).

[Michel Zinsmeister](#) (Université d'Orléans):

Introduction to Growth Processes (6 hours).

For more information and registration please visit the [website of the workshop](#)

Past Event: Biomathematics Day

- A full-day seminar on Wednesday 25 March 2009, in Kumpula, Exactum. Participation is free but prior registration is necessary (email [eva.kisdi \[funny character\] helsinki.fi](mailto:eva.kisdi@funny.character.helsinki.fi)). See the program in [pdf](#). Welcome!

Past Event: Berezin transform in polynomial Bergman spaces and fluctuations of eigenvalues of random normal matrices

Short course given by [Håkan Hedenmalm](#) (Royal Institute of Technology, Stockholm) at the University of Helsinki (Kumpula campus, Exactum) between 27 and 30 October 2008 (Mon-Thu). Lectures each day 10-12 in room B222.

Past Event: Lectures by Karl Hadelér

Karl Hadelér (University of Tübingen and Arizona State University) gives a series of five lectures between 29 September and 2 October 2008 in the Exactum building of Kumpula:

- Dynamical systems with quiescence (Monday 29 September, 10-12, lecture room D122)
- Equilibrium configurations of granular matter (Monday 29 September, 14-16, lecture room D122)
- Random walks and diffusion equations (Tuesday 30 September, 14-16, lecture room D123)
- Forward and backward problem of traveling front (Wednesday 1 October, 10-12, lecture room D122)
- TBA (Thursday 2 October, 12-14, lecture room D123)

Past Event: The Helsinki Summer School on Mathematical Ecology and Evolution

The summer school on mathematical ecology and evolution consists of graduate-level lectures on five topics at the research frontier. More information about the summer school organized in 2008 you find [here](#).

Past Event: Non-classical noises

Short course given by Boris Tsirelson (School of Mathematics, Tel Aviv University) at the University of Helsinki (Kumpula campus, Exactum) between 10 and 14 March 2008 (Mon-Fri).

Many people know white noise. However, there are many other important noises that have been rigorously studied recently. Boris Tsirelson (Tel Aviv University) will give an introduction to these 'non-classical' noises. Among other things he is well-known for his contributions to the theory of black noise. Welcome !

Time and place:

Mon 10.30 - 11.30 in room C323
Tue 12.15 - 14.00 in room C323
Wed 10.15 - 12.00 in room C323
Thu 10.15 - 12.00 in room C323
Fri 10.15 - 12.00 in room B120

Past seminars: First research seminar

10 March (Monday) 13.00 - 16.45 in auditorium CK112 (Kumpula campus, Exactum)

13.00 - 14.00 **Ilkka Hanski** (Department of Biological and Environmental Sciences, University of Helsinki): [Spatial patterns of coexistence of competing species in patchy habitats](#)

14.00 - 14.30 Coffee

14.30 - 15.30 **Kurt Johansson** (Mathematics Institute, Royal Institute of Technology, Stockholm): Random matrix universality

15.45 - 16.45 **Boris Tsirelson** (School of Mathematics, Tel Aviv University): Moderate deviations for random fields and random complex zeroes

[Abstract](#)

28 May 2008 (Wednesday) 14-16 in room C123 (Exactum, Kumpula)

Peter W. Jones (Yale University): Diffusion Geometry and Local Uniformization by eigenfunctions.

[Abstract](#)

Past Event: A DAY OF ANALYSIS AND DYNAMICS

Thursday May 29 10.30-16.00 Lecture room D123

The Academy of Finland Center of Excellence in Analysis and Dynamics presents a day of lectures aimed for a general mathematical audience

Program

10.30 A. Kupiainen: ["Towards a proof of Fourier's law"](#)

11.30 M. Gyllenberg: "Volterra functional equations inspired by population dynamics"

12.30 Lunch

14.00 K. Astala: ["The non-linear Fourier transform for the conductivity equation"](#)

15.00 E. Järvenpää: "Dimensions of visible parts"

EVERYBODY WELCOME !

General information on courses and seminars

Basic courses

The dynamical systems course that has been taught by the mathematical physicists will be made a basic course common to all and taught every year. It will serve as a springboard for the evolutionary dynamics courses, for courses in extended dynamics and complex dynamics as well as for geometric measure theory courses.

We will also organize interdisciplinary courses in physics and biology on the graduate level and plan to have some biology courses aimed for mathematicians in the same vein.

Intensive courses

Intensive courses will be given by outstanding professors invited from abroad as well as by the professors of the CoE themselves. Such courses have proved to be very effective. We shall also continue the successful practice of holding some of our research workshops in connection with the Jyväskylä Summer School. The following courses are already planned:

- Stochastic aspects of complex dynamics (M. Zinsmeister)
- Statistical turbulence: from numerical simulations to renormalization group analysis (A. Mazzino)
- Evolutionary dynamics through bifurcation analysis: methods and applications (F. Dercole)

The biomathematics group organized a bi-annual series of international schools in 2008, 2010 and 2012 on the topic of mathematical ecology and adaptive dynamics, each lasting 5 days. The title of the series will be "The Helsinki Summer School on Mathematical Ecology and Evolution".

Seminars

The CoE will organize a series of weekly seminars that is to be attended by all our graduate students and post-docs, who will also give presentations themselves to improve their communication skills. Our students are also encouraged to attend the frequent seminars given by visitors to our departments.

Workshops

The CoE will organize two kinds of workshops:

1. Full-day seminars that cover the current activity of the CoE. These will introduce our students and post-docs to the full spectrum of our research, and help to exploit all collaborative possibilities within the CoE.
2. International workshops dedicated to particular research topics in January 2009, 2011, and 2013. These will last typically 3-5 days and have 20-30 participants, about two-thirds of them from abroad.