UPPSALA UNIVERSITY
DEPARTMENT OF MATHEMATICS
Jordi-Lluís Figueras

Special Course in Mathematics II
Spring 2015

Special Course in Mathematics II

The course Special Course in Mathematics II 1MA239 consists of 15 lectures. The lectures will be given in English.

Teaching

The lectures intend to give an overview of several advanced topics in Mathematics. A tentative list of topics is:

- The shower problem: An introduction to delay equations.
- Interval analysis and computer assisted proofs.
- Fractals on the complex plane: Julia sets of the quadratic map. The Mandelbrot set.
- Banach-Tarski paradox.
- Random processes. Markov chains on graphs.
- How to think ODEs and PDEs in a discrete way and applications: The relation between the Laplace equation and random walks, the heat equation.
- Lagrange's four-square theorem. The 15 theorem.
- The Prime Number Theorem.

Basic ideas will be given priority to precise statements and proofs.

There will be no problem sessions since much of the lecture time will be devoted to present the ideas behind the topics. Nevertheless, you are strongly advised to solve the problems proposed during the lectures.

Examination

As said above, no hand-in of problems is mandatory, but voluntary.

Each student must give a 25 minutes seminar. The topic will be chosen together with the lecturer. Also, a 5-8 pages long report on the same topic as the seminar must be prepared.

Uppsala, 23th of January 2015.

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