MATH-654

Topics in 2D continuum random geometry

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Cursus	Sem.	Type
Mathematics		Obl.

Language of teaching	English
Credits	3
Session	
Exam	Oral presentation
Workload	90h
Hours	**56**
Courses	28
TP	28
Number of positions	

Frequency

Only this year

Remark

Next time: Spring 2019

Summary

This course is about 2D continuum random geometry. We will overview the recent progress in describing and studying natural families of random curves (SLE), random height functions (GFF) and random metrics (LQG), emphasising the intimate connections between these objects.

Content

This course is about 2D continuum random geometry, a topic that has seen a rapid development over the past 20 years. We will discuss topics like the Schramm-Loewner evolution (a family of random curves), the Gaussian free field (a natural random height function), Brownian loop soups and Gaussian multiplicative chaos (a building-block for probabilistic models of 2D quantum gravity). An important part of this course is emphasising the strong connections between these objects and the interplay between probability theory and complex analysis.

Previous encounters with Brownian motion and complex analysis (to the level of Riemann mapping theorem) are very helpful.

Keywords

random geometry, conformal invariance, Brownian motion, Schramm-Loewner Evolution, Gaussian free field, Gaussian multiplicative chaos…

Learning Prerequisites

Recommended courses

Basic courses on measure theory, stochastic processes and complex analysis.

Learning Outcomes

By the end of the course, the student must be able to:

- to describe the zoology of 2D random geometry.

Resources

Bibliography

There are several lecture notes available on the internet, most notably by W. Werner (on SLE and on GFF), by J. Miller (on SLE), N. Berestycki (on GFF and Gaussian multiplicative chaos).