

MATH-560

Stochastic epidemic models

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Cursus	Sem.	Type
Ing.-math	MA2, MA4	Opt.
Mathématicien	MA2	Opt.

Language of teaching	English
Credits	5
Session	Summer
Semester	Spring
Exam	Written
Workload	150h
Weeks	14
Hours	4 weekly
Courses	2 weekly
Exercises	2 weekly
Number of positions	

Summary

This course is an introduction to some classical models of epidemics involving random mechanisms.

Content

1. **Basics on Branching processes and Poisson process**
2. **Stochastic SEIR model and related models:** definitions, basic reproduction number, probability of a major outbreak, final size of the epidemic, vaccination
3. **Markovian epidemic models:** deterministic SEIR, law of large numbers and central limit theorem, diffusion approximation
4. **(Non-markovian) closed models:** final size of the epidemic, duration of the epidemic
5. **Markov models with demography:** stable endemic equilibrium, extinction of the disease

Keywords

Stochastic epidemic, basic reproduction number, branching processes, limit theorems

Learning Prerequisites**Required courses**

MATH-330 : Martingales et mouvement Brownien
MATH-332 : Stochastic processes
MATH-432 : Probability theory

Important concepts to start the course

Students are expected to be familiar with or at least able to catch up quickly with (discrete) martingales, Markov chains and convergence of random variables. Recalls will be made during the first lectures and exercise sessions.

Teaching methods

Lectures followed by exercise sessions

Assessment methods

Written

Resources**Bibliography**

Stochastic Epidemic Models with Inference ## Tom Britton and Etienne Pardoux
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Ressources en bibliothèque

- [Stochastic Epidemic Models with Inference / Britton & Pardoux](#)