

MATH-560

Stochastic epidemic models

Ged François Gaston

| Cursus | Sem. | Type |
|---------------|----------|------|
| Ing.-math | MA1, MA3 | Opt. |
| Mathématicien | MA1, MA3 | Opt. |

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|----------------------------|-----------------|
| Language of teaching | English |
| Credits | 5 |
| Session | Winter |
| Semester | Fall |
| Exam | Written |
| Workload | 150h |
| Weeks | 14 |
| Hours | 4 weekly |
| Lecture | 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 compartment model:** basic reproduction number, probability of a major outbreak, final size of the epidemic, vaccination
3. **Markovian compartment models:** functional 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. **Epidemic models with two levels of mixing:** probability of a major outbreak, final size of the epidemic

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 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](#)