# Mathematics of infectious diseases, fall 2011

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This course is an introduction to the mathematical modeling of the spread of infectious diseases in populations, and to mathematical techniques for analyzing the resulting models. The course will first discuss various types of basic ordinary differential equation (ODE) models, and their underlying assumptions. We will then briefly touch upon some basic stochastic models. Once the basics are in place, we will study more advanced topics such as

- more general dependence of infectivity and virulence on the time since infection
- the effects of population structures, including age structure and sex structure
- the effects of contact patterns within population
- spatial models
- competitive exclusion of parasite strains, and the evolution of parasite virulence and host defense

### News

### Lecturer

Thanate Dhirasakdanon (Email, PGP public key)

Office hour (A412): Monday, 13:00-14:00, and by appointment.

### Scope

10 cu.

### Type

Advanced studies

### Prerequisites

Some familiarity with (ordinary) differential equations and elementary probability theory. Other mathematical tools will be developed in class as needed.

### Lectures

Weeks 36-42 and 44-50, Monday 14:15-16:00 in room C123 and Thursday 10:15-12:00 in room B321. Two hours of exercise classes per week.

### Lecture notes

Lecture notes (last updated 19 Jan 2012)

### Exercises

Homework #1 (solutions)

Homework #2 (solutions)

Homework #3 (solutions)

Homework #4 (solutions)

Homework #5 (solutions)

### Exams

### Bibliography

I found myself relying mainly on the following two books.


- F. Brauer *et al.* (eds.), Mathematical Epidemiology (Lecture Notes in Mathematics), Springer, 2008.
- H. R. Thieme, Mathematics in Population Biology, Princeton University Press, 2003.


Additional texts:


- O. Diekmann and J.A.P. Heesterbeek, Mathematical Epidemiology of Infectious Diseases, Wiley, 2000.
- H. Andersson and T. Britton, Stochastic Epidemic Models and Their Statistical Analysis (Lecture Notes in Statistics), Springer, 2000.
- M. Nowak and R. May, Virus Dynamics: Mathematical Principles of Immunology and Virology, Oxford University Press, 2000.
- U. Dieckmann *et al*. (eds.), Adaptive Dynamics of Infectious Diseases, Cambridge University Press, 2002.
- M. Keeling and P. Rohani, Modeling Infectious Diseases in Humans and Animals, Princeton University Press, 2007.

See also: the webpage of previous course.

## Registration

Did you forget to register? What to do.

## Exercise groups

| Group | Day | Time | Place | Instructor |
|---|---|---|---|---|
| 1. | Wednesday | 14:15-16:00 | C130 | Ilmari Karonen (Email) |