



Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich



UNIVERSITÄT
BERN



Mathematical Modelling in Infectious Disease Epidemiology

January 18 - 20, 2016

Course description

Faculty

Dr. Christian Althaus, PhD

Institute of Social and Preventive Medicine (ISPM), University of Bern, Switzerland

PD Roland Regös, PhD

Institute of Integrative Biology, ETH Zurich, Switzerland

Place

CH – 3823 Wengen | SWITZERLAND

Hotel Falken Room Bühlstube (see map on <http://www.epi-winterschool.org/hotels>)

Introduction

Modelling of the dynamics of infectious diseases is becoming increasingly important for improving understanding about transmission and the potential impact of public health interventions. In this course, students will be introduced to the main concepts of mathematical modelling of infectious diseases such as the basic reproductive number, R_0 . We will further study topics such as vaccination thresholds, stochastic effects, sexual networks and superspreading. The students will be able to work on real-life applications of infectious disease modelling with case studies of seasonal influenza and the Ebola outbreak in West Africa. Exercises will be conducted in the programming language R. Previous knowledge of R will be useful but is not essential.

Course objectives

- To understand the role of infectious disease dynamics for research and health care
- To become familiar with the main concepts of mathematical models of infectious diseases
- To use simple mathematical models to study disease transmission and control interventions

What you have to bring

Students will bring their own laptops with an installed version of R or RStudio. Both applications run on Windows, Mac OS X and Linux and can be freely downloaded at <http://www.r-project.org> or <http://www.rstudio.com>.

Contact:

University of Bern | Institute of Social and Preventive Medicine
Finkenhubelweg 11
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www.epi-winterschool.org | winterschool@ispm.unibe.ch

Outline of course

The course will run over three days and consists of lectures in the morning and computer practicals during the evening. During the extended break in the afternoon, participants review course materials, catch up on emails or go skiing.

Monday, January 18th (8:30 – 12:00 | 17:00 – 19:00)

- Introduction to mathematical epidemiology
- Basic concepts of population dynamics
- Compartmental models (SEIRS; susceptible-exposed-infected-recovered)
- Basic reproduction number R_0 , vaccination thresholds
- Computer exercises: Getting started with R (installing necessary packages), simulating an influenza epidemic, exploring the impact of vaccination

Tuesday, January 19th (8:30 – 12:00 | 17:00 – 19:00)

- Parameter inference and seasonal forcing
- Stochastic effects (observational and process noise)
- Gillespie algorithm and stochastic simulations
- Superspreading events
- Computer exercises: Investigating stochastic effects during Ebola outbreaks

Wednesday, January 20th (8:30 – 12:00 | 17:00 – 19:00)

- Sexually transmitted infections (STIs)
- Determinants and modelling of STI transmission (sexual networks)
- Ebola outbreak in West Africa
- Real-time modelling for outbreak management
- Computer exercises: Studying Ebola transmission and the impact of control interventions

Credit 1.5 ECTS

Maximum number of participants The maximum number of participants on this course will be 16.

Course fee Academic: CHF 900
Industry: CHF 1800

Registration Registration on the Winter School website www.epi-winterschool.org.

Course hotels The participants have to book their accommodation themselves (see map and recommendation on www.epi-winterschool.org/hotels).
