

New Elective Course

The Origin and Spread of Infectious Diseases

The Department of Biological Applications and Technology, University of Ioannina, is pleased to announce this *new course* beginning on Wednesday 7/10/20 at 12pm in Lecture Theatre A (New BET building, ground floor). This first lecture will be mainly an introductory meeting. Feel free to come along, no obligations attached! More is available on the e-course and in attached document.

Note: this course is part of **both** cycles in BET.

Why this course?

We have become aware of the power of infectious diseases to change our lives after the major changes worldwide in the face of the expanding Coronavirus pandemic over the last 8 months. As a department, BET is devoted to the publication and transmission of current biological knowledge. This course will familiarize students with mechanisms of spread and expansion of epidemics. This will be done from the perspective of population dynamics and also from an ecological and evolutionary perspective. Students learn to:

- ✓ Understand the basic features of disease epidemics
- ✓ Apply models to predict the course of an epidemic
- ✓ Analyse epidemiological data
- ✓ Understand the evolutionary and ecological context of epidemics
- ✓ Apply different approaches for the control of epidemics

Course contents

The series of themes is as follows

- 1) Introduction and terminology. Agents of infectious disease. Microparasite types and vectors of disease.
- 2) Review of famous important historical epidemics such as bubonic plague, smallpox, cholera, AIDS/HIV and the influenza group.
- 3) The use of models in understanding and managing disease outbreaks
- 4) The SIR model 1 - Dynamics of an infectious disease
- 5) The SIR model 2 - Understanding and estimating the “R0” parameter
- 6) The SIR model 3 - Estimating parameters of an epidemic
- 7) The key role of animals in mediating transmission of infectious diseases. Reservoirs of infection in wild animals, livestock markets and factory farms. Forecasting future outbreaks.
- 8) The ecological role of disease in the natural world: rabies, myxomatosis, seal fever, amphibian plagues. The evolutionary context of disease
- 9) Spatial infection models and networks
- 10) Control techniques: quarantines, herd immunity, partial vaccination

Laboratory work will include:

1. Introduction to the R programming environment
2. The R environment for epidemiology: “epimdr”, “outbreaks” and others
3. Simulating the dynamics of epidemics through the SEIR and SIR models
4. Applying model solutions to real data

5. The spatial and network extension of models

Teaching approach

Three hours per week. Sessions will include lectures, lab-work, discussions of published literature and solving problems. All basic concepts will be developed through interactive lectures, with minimal requirements for mathematical technique. Issues will be illustrated with reference to historical epidemics. Modelling will play an important role in this course, especially in lab work.

Course prerequisites:

Up to 30 may attend, on a first-come-first-served basis.

Evaluation:

Exam (50%), Labs and written reports (50%). 3 ECTS

Language

The course language is English.

Textbooks

Vynnycky, Emilia, and Richard White. *An introduction to infectious disease modelling*. OUP oxford, 2010.

Verzani, John. "Using R for Introductory Statistics." New York: CUNY, 0.4 edition URL <http://www.math.csi.cuny.edu/Statistics/R/simpleR/index.html> 106 (2002).

Bjørnstad, Ottar N. "Epidemics." *Models and data using R*. Springer International Publishing, 2018.

John M. Halley, BET.

1st October 2020