

Mathematical Modelling of Infectious Diseases  
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The objective of this course is to present a detailed introduction to modelling infectious diseases. We will discuss modeling at the population level, as these models represent some of the most classical results. We will then focus on host-pathogen interactions within the host. We will explore such pathogens as HIV, malaria, human papilloma virus (cervical cancer), Tuberculosis, smallpox, anthrax and herpes simplex virus. Topics will include vaccines, drug resistance, the basic reproductive ratio, bioterrorism and networks. Theoretical tools will include differential equation models, game theory, uncertainty/sensitivity analysis, Latin Hypercube Sampling and impulsive differential equations. Current literature will be assigned and discussed in class throughout the course.

### **Suggested readings**

D. Earn, *A Light Introduction to Modelling Recurrent Epidemics*, book chapter.  
<http://mysite.science.uottawa.ca/rsmith43/MAT4996/earn.pdf>

E. Kajita et al, *Modelling an outbreak of an emerging pathogen*. Nature Rev. Microbiology 5, pp. 700-709 (2007).  
<http://mysite.science.uottawa.ca/rsmith43/MAT4996/blowerMRSA.pdf>

P. Hotez et al, *The Neglected Tropical Diseases: The Ancient Afflictions of Stigma and Poverty and the Prospects for their Control and Elimination*. Book chapter  
<http://mysite.science.uottawa.ca/rsmith43/MAT4996/HotezOtteson.pdf>

S. Ruan, D. Xiao and J.C. Beier, *On the Delayed Ross-Macdonald Model for Malaria Transmission*. Bulletin of Mathematical Biology 70, pp. 1098-1114 (2008)  
<http://mysite.science.uottawa.ca/rsmith43/MAT4996/RuanXiao.pdf>