Description: This course introduces the student to mathematical modelling with applications in biology in related fields such as chemistry, ecology and health. There is an emphasis on case studies and problem solving skills. Topics include discrete and continuous models describing population dynamics, population health, chemical reactions and biological structures.

Syllabus

- Simple models of growth and decay
- Leslie Matrices
- Population interactions
- Population health
- Molecular events
- Neural networks
- Project Presentations and discussion

Course notes - readings are assigned.
Computer labs are on Wednesdays (in Gauss Lab, Ross S110).
Presentations (individual and group) will be assigned, and are part of the final participation mark.

References: There is no assigned textbook. The material will be based on the references below, and papers from the literature. The material covered will be subject to revision and/or extension as the course progresses.

- Brauer, F., van den Driessche, P. and Wu, J. Mathematical Epidemiology, Springer.
- Diekmann, O., Heesterbeek J.A.P. Mathematical Epidemiology of Infectious Diseases, John Wiley & Sons.
- Edelstein-Keshet, L. Mathematical Models in Biology, Oxford University Press.
- Nowak M.A. and May, R.M. Virus Dynamics, Oxford University Press.
- Rubinow, SI Introduction to Mathematical Biology, John Wiley & Sons.

Software: MATLAB and Maple will be used to conduct computational analyses of models, which are available in the Gauss Lab (Ross S110) – you are required to obtain an account and an access card.
**Evaluation:** The final grade for the course will include the following components:

10% - Participation, in class presentations, reflection papers  
5% - Project proposal  
5% - Project outline  
5% - Project discussion, meeting with professor  
10% - Presentation of final project (duration to be decided later)  
20% - Midterm (takehome – using CrowdMark)  
20% - Final (takehome – using CrowdMark)  
25% - Written report of final project (approx. 10-20 pages)

**Bonus:** Students that participate in the COMAP Mathematical Modelling competition earn 2 bonus marks.

**Takehome Exam and Project Submissions:** Takehome exams will be submitted using CrowdMark. We will introduce you to this web application in the beginning of the term. Late submissions will not be accepted. Make sure that your work is clearly written, and that all pages are uploaded to CrowdMark appropriately. Give yourself extra time to upload your work. Takehome exams are individual work. You are not permitted to talk to anyone (family, friends, classmates, etc) about the exam questions.

Assignments consist of mathematical problems as well as readings (assigned papers from the literature). Students are required to write a one page discussion on the required readings (submitted with the assignments).

Project components should be typed using a word processor, or using LaTeX.

**Participation:** This grade consists of attendance, in class presentations, and reflection papers.

Note: English grammar WILL COUNT towards your final grade (and on all tests, project components and reflections papers that you submit).

**Important Dates**

Midterm – Feb 24-26, (start 5pm Feb 24, due 9pm on Feb 26)  
Final – will be scheduled during the exam period.

A project proposal is due on **Feb 3**. On **Mar 9** a rough draft/outline of the work to be included in the final project is due. Project presentations will be during the last week of class (approximately) and will include a peer evaluation/participation mark. The written version of the project is due on **Apr 20 by 4pm**. Students are required to make an appointment with me to discuss their research project in the first two weeks of **February**.

There are no classes between **Feb 15-23**.

**Important Course Information for Students:** All students are expected to familiarize themselves with the following information, available at [http://secretariat-policies.info.yorku.ca/](http://secretariat-policies.info.yorku.ca/)

- York’s Academic Honesty Policy and Procedures/Academic Integrity Website
- Ethics Review Process for research involving human participants
- Course requirement accommodation for students with disabilities, including physical, medical, systemic, learning and psychiatric disabilities
- Student Conduct Standards
- Religious Observance Accommodation