York University
MATH 3250 3.0
Mathematical Biology

Instructor
Jane Heffernan
Associate Professor

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(to make appointments only)

Office Hours
N615 Ross, M 10:00-11:00am

Time and Place
Winter 2017
CB120
MWF: 12:30-1:30
(Starting Jan 17, Wednesday lectures will be in the Gauss Lab)

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 (1 week, or a conference during exam period)

In each section an introduction to the mathematics is given, with an application in biology.

References: There is no assigned textbook. The material will be based on the reference texts below as well as 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.
- Caswell, H. Matrix Population Models, Sinauer Associates.
- Diekmann, O., Heesterbeek J.A.P. Mathematical Epidemiology of Infectious Diseases, John Wiley & Sons.
- Edelstein-Keshet, L. Mathematical Models in Biology, Oxford University Press.
- Keeling, M.J., Rohani, P. Modeling Infectious Diseases in Human and Animals, Princeton 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:

40% - Assignments (3 @ 13.3%)
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)
25% - Written report of final project (approx. 10-20 pages)

Bonus: Students that participate in the COMAP Mathematical Modelling competition will receive 2 bonus marks.

Assignment and Project Submissions: Assignments and final written reports should be submitted at the beginning of the lectures at their due dates. Late assignments will not be accepted. Assignments must be given to me in hard copy; emailed assignments will not be graded. Make sure that your assignments are clearly written. Answers should be in numerical order.

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). Mathematics and English grammar WILL COUNT towards your final grade.

Project components should be typed using a work 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
Assignments will be due on Feb 2, Mar 2, Apr 2

A project proposal is due on **Feb 2**. On **Mar 2** 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 18 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 19-23**.

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

- 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