

1. BASIC INFORMATION

The objectives of this course are to learn to apply mathematical tools to solve open-ended, real-world problems, to understand the benefits and limitations of mathematical modelling, and to critically assess the predictions based on mathematical models, as well as to stimulate interest in studying more advanced mathematics topics (e.g. numerical analysis, differential equations, probability and statistics, and optimization.)

- Instructor: Dr. Daniel Korytowski. Contact me by email at korytowd@math.mcmaster.ca or come see me in Hamilton Hall office **407** during my office hours (Monday and Wednesday 12:45AM-2:15PM).
- The TA for the labs is Alexandra Bushby, bushbya@mcmaster.ca with office hours at 11:30-12:30 on Thursdays in the math cade.
- Class times and location: Lectures are in TSH/B106 on Monday and Wednesday 11:30PM-12:20PM and Friday 1:30-2:20. Computer labs are in BSB/241 on Tuesday 10:30-11:20, BSB/241 on Thursday 9:30-10:20, or KTH/B121 Monday 9:30-10:20. You are responsible for all material presented in your registered lab.
- Textbook: Course In Mathematical Modeling, Author Mooney, Copyright 99, Publisher American Math Society.
- Prerequisite(s): One of MATH 1AA3, 1LT3, 1XX3, ARTSSCI 1D06 A/B, ISCI 1A24 A/B; and one of MATH 1B03, 1ZC3, 1ZZ5
- Course Website: All material (assignments, lecture notes, a full schedule, ...) will be posted on the web at <https://ms.mcmaster.ca/korytowd/math3mb3/>. Content will be added throughout the semester, so you will need to check back now and then. The material I will use is derived from notes courtesy of Dr. J. Feys and Dr. B. Bolker.

- Software: We will use Matlab and its free alternative Scilab throughout the course. Matlab may be available on McMaster university computers, but it may be more convenient to install Scilab on your own system. Scilab is small, fast and its syntax is almost identical to that of Matlab. During labs, it is advisable to bring (or share) a laptop. To accommodate students from various fields outside of math. Full assistance with Matlab is guaranteed during labs, no assistance with Scilab is guaranteed.

2. MARK DISTRIBUTION

There will be a midterm exam in class and a final exam at a time determined by the registrars office. Class homework includes five assignments and a group project. Concerning the project: a written proposal is due at the start of November and a presentation and written final report including individual statements of contribution of each student towards the end of the semester. Your final grade will be calculated using maximum of the following two combinations:

- (1) 25% Assignments, 25% projects, 25% midterm exam, 25% final exam
- (2) 35% Assignments, 35% projects, 30% final exam

- Assignments: There will be five homework assignments to hand in for marks (5% each). The due dates for these assignments are on the course website. Assignments are to be handed in before 11:59PM on the day they are due. Send your assignment submission to the TA in an email with the following subject: your MACID, followed by an underscore, and then the occasion of the submission (hw1, hw2, hw3, hw4, hw5). For example: my own email about homework 1 would be titled *korytoward_hw1*. Your submission must contain two files. First, a formatted text document with graphs with your answers to the assignment questions. The file must be a PDF file; if you use Word or other word processing, be sure to print to pdf. Second, the computer code (Matlab or Scilab) you wrote to generate the graphs. The TA may execute your code so make sure it runs properly. Late submissions will not be accepted.
- Group project: You will be invited to form groups of four to six students. Each group selects one topic from a list of project topics that will appear on the course website, or you may come up with your own project. You will study this topic and write a project proposal and report about it. At the end of the semester, your group will present its findings in class.

Each group must send its submission to the TA via an email with the following subject: your project topic, followed by an underscore, and then the occasion of the submission (proposal or report). For example: my groups project proposal for a project about bacteriophage would be titled bacteriophage proposal. Detailed information about what is expected of you for the project will be provided during the lectures. Due to the fact that a large number of lectures are dedicated to the group project, attendance may be taken during only those classes. Out of respect to each member of your group, it is important that you attend the sessions and actively participate in the research and writing of the project.

3. COURSE CONTENT

The course will involve creative and empirical model construction. Given real-world scenarios, students will learn to identify a problem, make appropriate assumptions, propose a model, test the assumptions, refine the model if necessary, fit the model to data if appropriate, analyze the underlying mathematical structure of the model in order to appraise any sensitivity of the conclusions to the assumptions and model construction.

Students will learn model analysis. Given a model, they will learn to work backwards to uncover any implicit assumptions, assess critically how well the assumptions reflect the scenario at hand, and estimate the sensitivity of predictions to modifications of the assumptions.

The course will focus on modelling of dynamical systems, with an emphasis on biological systems; deterministic discrete-time, stochastic discrete-time, and deterministic continuous-time (ordinary differential equation) models will be covered.

The computer language Matlab will be introduced. This package can be used for graphical displays of data, numerical solutions of different dynamical systems, and simulation modelling.

4. POLICIES

- (1) You should be aware of the policies concerning Requests for Relief for Missed Academic Term Work. It is important to know your rights and your responsibilities. If you must miss a lecture, it is your responsibility to find out what was covered.

The best way to do this is to borrow a classmates notes, read them over, and then ask your instructor if there is something that you do not understand.

- (2) I reserve the right to change the weighting in the grading scheme. If changes are made, your grade will be calculated using the original weighting and the new weighting, and you will be given the higher of the two grades. At the end of the course the grades may be adjusted but this can only increase your grade and will be done uniformly. I will use the standard Undergraduate Grading scale to convert between letter grades, grade points and percentages. For details, see the section on Grade Point values on the [Office of the Registrars website](#).
- (3) No calculators or other aids will be allowed during examinations unless explicitly indicated.
- (4) You will be required to bring your official McMaster University photo identification card to the final examination.
- (5) Student grades will be returned by email, using the official email I receive in the class list.

5. ACADEMIC INTEGRITY

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: Grade of F assigned for academic dishonesty), and/or suspension or expulsion from the university. It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at www.mcmaster.ca/academicintegrity. The following illustrates only three forms of academic dishonesty:

- (1) Plagiarism, e.g. the submission of work that is not ones own or for which other credit has been obtained.
- (2) Improper collaboration in group work.
- (3) Copying or using unauthorized aids in tests and examinations.

The list is non-exhaustive, of course.

This outline will be linked from the course home page. However, it is your responsibility to check the course home page and syllabus regularly for further announcements, course handouts, assigned work

and their due dates, information about test dates and locations when this information becomes available, downloadable course related material, etc. Click on the bold blue links in this document for more information.

6. ACADEMIC ACCOMMODATION OF STUDENTS WITH DISABILITIES LANGUAGE

Students with disabilities who require academic accommodation must contact [Student Accessibility Services \(SAS\)](#) to make arrangements with a Program Coordinator. Student Accessibility Services can be contacted by phone 905-525-9140 ext. 28652 or e-mail sas@mcmaster.ca. For further information, consult McMaster University's [Academic Accommodation of Students with Disabilities](#) policy.