

MATH 360 (3 Credits)
Mathematical Modeling in Science
Session 2019W Term 1 (Sep–Dec 2019)

Prerequisite. Single-variable integral calculus including an introduction to ordinary differential equations (e.g. MATH 101). [An implicit prerequisite is single-variable differential calculus (e.g. MATH 100).]

Course Instructor. Wayne Nagata

Contact Details. Drop in to office hours or email nagata@math.ubc.ca

Office Hours. M W F 1:00–2:00

Office Location. Mathematics building, room 112

Course Canvas Page. <https://canvas.ubc.ca/courses/42267>

Course Structure. Traditional lectures, Tue Thu 09:30–10:50. Notes will be posted after lectures on the **Course Web Page** <http://www.math.ubc.ca/~nagata/m360/>.

Course Topics.

1. *Optimization in one variable.* Finding maxima or minima of quantities in mathematical models.
2. *Continuous-time dynamical systems.* Ordinary differential equations. Methods of solution and qualitative analysis. Bifurcations. Construction and analysis of mathematical models involving continuous time.
3. *Discrete-time dynamical systems.* Difference equations or iterated maps. Methods of solution and qualitative analysis. Bifurcations. Construction and analysis of mathematical models involving discrete time.
4. *Probability and models.* An introduction to basic probability concepts. Construction and analysis of mathematical models involving probability.

Course Textbook. There is no course textbook.

Additional References. See the course web page (URL given above).

Learning Outcomes. See the course web page (URL given above).

Learning Assessment. Five homework assignments, each contributing 4% of the final grade. One midterm test, contributing 30% of the final grade. One final examination, contributing 50% of the final grade. See the course Canvas page for more details on the content of each component of the final grade.

Homework assignments that are submitted late are not marked. There are no make-up tests for missed in-class tests. If academic concession for a missed homework assignment or in-class (midterm) test is requested by a student and approved by the course instructor, then the marks for the missed component are shifted onto the final examination. Examples of valid reasons include illness and being absent from campus to represent the University, British Columbia or Canada in a competition or performance. Examples of reasons that are not valid include conflicts with personal travel schedules or conflicts with work schedules. Note that a student

who misses the in-class test and has otherwise not completed a substantial portion of the term work shall not be admitted to the final examination.

If the final examination is missed, a student can apply for academic concession to their dean or director or their designate (such as an academic advising office). A student's academic performance in a course up to the final examination is taken into consideration in granting deferred examination status (e.g. if a student is already failing then deferred examination status will not be granted). Note that a conflict with a student's personal travel schedule is not a valid reason for missing the final examination. A student who misses the final examination for this reason will receive a mark of 0 for the final examination and therefore will fail the course.

For more details on academic concession see the UBC Calendar website <http://www.calendar.ubc.ca/vancouver/index.cfm?tree=3,329,0,0>.

University Policies. UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available on the UBC Senate website <https://senate.ubc.ca/policies-resources-support-student-success>.

Version: 2019-09-04