

MATH 6071 — Biomathematics

Winter 2023

Department of Mathematics and Statistics, University of Guelph

General Course Information

Instructor: [A. Willms](#), MACN 512, ext. 52736

Office Hours: TBA

Lectures: Mon., Wed., & Fri. 10:30-11:20 a.m. in MCKN 119

Website: This course is on the web at the University's [CourseLink](#) page. It contains the information on this page as well as other information that will be updated regularly, including assignments, and posted marks.

Calendar Description

The application of mathematics to model and analyze biological systems. Specific models to illustrate the different mathematical approaches employed when considering different levels of biological function.

Learning Outcomes

- Gain an appreciation for the many different types of mathematics that can be used to model diverse biological phenomena.
- Be able to scrutinize a mathematical model in terms of its applicability to a certain biological situation, noting the model's assumptions, strengths, and limitations.

Texts

We shall cover a number of the sections/chapters from the text by Murray (in two volumes). The other two texts are good references. All have been placed on reserve in the library; the book by Murray is on reserve both as a physical copy and in electronic form.

- J.D. Murray, *Mathematical Biology*, 3rd Edition, Vols. I and II, Springer, 2002.
- G. de Vries, T. Hillen, M. Lewis, J. Müller, and B. Schönfisch, *A Course in Mathematical Biology* SIAM, 2006.
- M.A. Lewis, M.A.J. Chaplain, J.P. Keener, and P.L. Maini, editors, *Mathematical Biology*, IAS/Park City Mathematics Series Volume 14, The American Mathematical Society, 2009.

Topics

- Murray Selections from Vol. I, Chapters 1-4: Population Models
- Murray Vol. I, Chapter 6: Reaction Kinetics
- Murray Vol. I, Chapter 7: Biological Oscillators and Switches
- Murray Vol. I, Chapter 11: Reaction Diffusion, Chemotaxis and Non-local Mechanisms
- Murray Vol. I, Chapter 13: Biological Waves: Single Species Models
- Murray Vol. II, Chapter 2: Spatial Pattern Formation with Reaction/Population Interaction
- Murray Vol. II, Selections from Chapter 3: Animal Coat Patterns and Other Practical Applications of Reaction Diffusion Mechanisms

Evaluation

Assessment	Dates	weight
Presentation of Text Section 1	Fri. Jan. 20 to Mon. Feb. 13	25%
Presentation of Text Section 2	Wed. Feb. 15 to Fri. Mar. 17	25%
Presentation of Article	Mon. Mar. 20 to Mon. Apr. 10	30%
Three Short Assignments	Three of Jan. 30, Feb. 10, Feb. 15, Mar. 6, Mar. 24	10%
Questions and Participation	Weeks 3-12	10%

Each student will present to the class two lectures each covering a section of the text by Murray, and one lecture on a journal article from the biomathematics research literature. In addition each student will hand in three very short assignments. For the paper presentations, each student will be assigned to read two of the papers presented by others and will hand in a list of three questions on that material at the **start** of the class where that paper is presented. This, along with overall participation in the class will constitute the last portion of the grading for the course.

The text book sections will be determined in advance and are sorted into 5 groups. These presentations will be scheduled in two halves, from Friday, Jan. 20 to Mon. Feb. 13, and from Wed. Feb. 15 to Fri. Mar. 17. The schedule will be selected in class on Friday, Jan. 13 via lottery. As your name is chosen by lottery, you will select one of the topics to present. After each student has selected one, we will go in reverse order to select a second, with the condition that you cannot select two topics from the same group, and must select one topic from the first half of the schedule and one from the second half.

For the article presentation, you will need to select a possible paper from the literature and receive permission from me to present it. These will be scheduled from Mon. Mar. 20 to Mon. Apr. 10. You must provide me with a candidate paper at least 4 weeks prior to your presentation date. Paper presentation dates will be selected during the second week of classes. Further details will be provided in class and on the web page.

All students are expected to be present for all presentations (except for legitimate absences due to illness etc.), and to participate by asking questions. In particular, you will be assigned to read two of the papers that are being presented by other students. On the days that those are presented you will hand to me, at the start of the class, a list of 3 questions about that material.

University Policies

E-mail Communication

As per university regulations, all students are required to check their uoguelph.ca e-mail account regularly: e-mail is the official route of communication between the University and its students.

When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. See the Undergraduate Calendar for information on regulations and procedures for [Academic Consideration](#).

Drop Date

Courses that are one semester long must be dropped by the end of the last day of classes; two-semester courses must be dropped by the last day of classes in the second semester. The regulations and procedures for [Dropping Courses](#) are available in the Graduate Calendar.

Copies of Out-Of-Class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required, however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to make a booking at least 14 days in advance, and no later than November 1 (fall), March 1 (winter) or July 1 (summer). Similarly, new or changed accommodations for online quizzes, tests and exams must be approved at least a week ahead of time.

More information: www.uoguelph.ca/sas.

Academic Misconduct

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

The [Academic Misconduct Policy](#) is outlined in the Graduate Calendar:

Recording of Materials

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

Resources

The [Academic Calendars](#) are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.

Disclaimer

Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings, changes in classroom protocols, and academic schedules. Any such changes will be announced via Courselink and/or class email.

This includes on-campus scheduling during the semester, mid-terms and final examination schedules. All University-wide decisions will be posted on the COVID-19 website (<https://news.uoguelph.ca/2019-novel-coronavirus-information/>) and circulated by email.

Illness

Medical notes will not normally be required for singular instances of academic consideration, although students may be required to provide supporting documentation for multiple missed assessments or when involving a large part of a course (e.g., final exam or major assignment).

COVID-19 Safety Protocols

For information on current safety protocols, follow these links:

- <https://news.uoguelph.ca/return-to-campuses/how-u-of-g-is-preparing-for-your-safe-return/>
- <https://news.uoguelph.ca/return-to-campuses/spaces/#ClassroomSpaces>

Please note, that these guidelines may be updated as required in response to evolving University, Public Health or government directives.