*We recognize and acknowledge that McMaster University meets and learns on the traditional territories of the Mississauga and Haudenosaunee nations, and within the lands protected by the “Dish With One Spoon” wampum, an agreement amongst all allied Nations to peaceably share and care for the resources around the Great Lakes.*

# BIOLOGY 4AE3 – Ecology and Evolution of Infectious Disease

# Fall 2023

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| --- | --- | --- |
|  |  |  |
| Instructor | Dr. Benjamin Bolker  (professor) | TBA  (teaching assistant) |
| Email | [b](mailto:kajiura@mcmaster.ca)olker@mcmaster.ca | TBA |

## Course Format

**Lectures:**

This course is in-person; lectures will be in Hamilton Hall 217, Mon/Thurs 12:30-1:20 PM and Tues 1:30-2:20 PM. Lectures will be recorded and will be available *upon reasonable request*.

## Course Description

Infectious disease plagues the natural and human worlds, affecting sex, death, and even taxes. This course surveys a wide variety of topics on the ecology and evolution of infectious disease, using examples from human, agricultural, and wildlife populations. Infectious diseases (ID) range from the prions causing bovine spongiform encephalopathy (mad cow disease) to viruses, bacteria, and protists, to creepy-crawly metazoan parasites (worms and flukes). We will ask questions like:

• *How do ecology and evolution shape the nature and distribution of IDs?* (**Death**: we are still trying to understand the ecological factors that allow virulent strains of influenza to jump between species)

• *How do IDs affect host evolution and shape ecological communities?* (**Sex**: the *Red Queen hypothesis* suggests that sexual reproduction evolved as a strategy to fight parasites.)

• *How can understanding ecology and evolution help us fight IDs, or promote them?* (**Taxes**: understanding evolution helps us design effective vaccines and drugs; biocontrol via the intentional spread of infectious diseases is often an economical way to control unwanted pest or invasive species.)

**Prerequisite(s):** [BIOLOGY 2F03](https://academiccalendars.romcmaster.ca/content.php?filter%5B27%5D=BIOLOGY&filter%5B29%5D=4AE3&filter%5Bkeyword%5D=&filter%5B32%5D=1&filter%5Bcpage%5D=1&cur_cat_oid=53&expand=&navoid=10775&search_database=Filter&filter%5Bexact_match%5D=1" \l "tt6142) (or [ISCI 2A18 A/B](https://academiccalendars.romcmaster.ca/content.php?filter%5B27%5D=BIOLOGY&filter%5B29%5D=4AE3&filter%5Bkeyword%5D=&filter%5B32%5D=1&filter%5Bcpage%5D=1&cur_cat_oid=53&expand=&navoid=10775&search_database=Filter&filter%5Bexact_match%5D=1" \l "tt2222)) and registration in Level III or above of an Honours Biology program. BIOLOGY 3FF3 is recommended.

## Course Learning Objectives

The course focuses on conceptual and critical thinking about ecological and evolutionary interactions among hosts and parasites (including infectious diseases as a special case). You will learn a variety of important concepts and theories in host-parasite biology (e.g. the *encounter* and *compatibility filters* for host infection; determinants of the evolution of virulence; basic compartmental models for infectious disease dynamics). More generally, you will be encouraged to think creatively and critically about biological problems by reading and discussing the primary and secondary literature. The course includes several writing assignments. By the conclusion of the course you should be able to reason carefully about the qualitative outcomes expected from host-parasite interactions in various ecological/evolutionary settings; suggest experimental or observational studies to test specific biological hypotheses; and critically interpret peer-reviewed research papers.

## Materials & Fees

*Textbook:* Claude Combes, [The Art of Being A Parasite](https://www.amazon.ca/Art-Being-Parasite-Claude-Combes/dp/0226114384/); available from the bookstore, also on the [Internet Archive](https://archive.org/details/artofbeingparasi0000comb)

*Platforms:*

* Course material including lecture notes and slides will be posted to the [course web page](https://bbolker.github.io/bio4ae3/)
* Class discussion/forums will be hosted on [Piazza](https://piazza.com/)
* Avenue to Learn will be used for assignment submission and posting student grades. Please see the section below on “Courses with An On-Line Element” for possible privacy concerns.
* Other platforms such as [Kritik](https://www.kritik.io/) or [hypothes.is](https://hypothes.is/) **may** be used (TBA)

### Important Dates

|  |  |
| --- | --- |
| Tues 5 September | First class |
| Thurs 5 October | Midterm 1 (in class) |
| Mon 9 October - Fri 15 October | Midterm recess |
| Mon 4 December | Midterm 2 (in class) |
| Tues 5 December | Last class |

## Course Topics

|  |  |
| --- | --- |
| **Topic** | **Schedule** |
| Epidemic dynamics | Week 1 |
| Infectious disease and host demography | Week 2 |
| ID and host communities | Week 3 |
| Within-host communities of pathogens | Week 4 |
| Host-parasite coevolution | Weeks 5-6 |
| Evolution of virulence | Week 7 |
| Evolution of resistance and tolerance | Week 8 |
| Parasite manipulation of host behaviour | Week 9 |
| ID counter-evolution (antimicrobial resistance and immune escape) | Week 10 |
| Parasite-mediated sexual selection | Week 11 |
| Ecosystems and emerging diseases | Week 12 |
| ***Topics, order, and timing are provisional*** |  |

## 

## Course Assessment

|  |  |  |
| --- | --- | --- |
| Grade Component | Weight | Notes |
| Class participation, quizzes, discussion questions | 15% |  |
| Midterm test | 25% | “Type A” MSAFs *cannot* be used for course components worth ≥ 25% of the total mark |
| Mini-essays | 15% |  |
| Emerging disease group project | 10% |  |
| Term paper | 25% |  |
| Final test (in-class) | 10% | Assignments worth ≤ 10% *can* be scheduled during the end-of-term test/exam ban |

Dates and weightings listed above are subject to minor change.

Final marks for the course are based on a total assessment of each student's record, based on the McMaster University Grading Scheme (see below). It is a student's responsibility to make sure that their marks are complete and correct. Grade adjustment techniques may be used, but marks will not be *lowered* below the grade based on the numerical score and the McMaster grading scheme.

Students are expected to abide by the University’s academic integrity expectations when completing all assessments in Biology 4AE3 in accordance with the following statement:

“By submitting this work, I certify that the work represents solely my own independent efforts. I confirm that I am expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. I confirm that it is my responsibility to understand what constitutes academic dishonesty under the [Academic Integrity Policy](https://secretariat.mcmaster.ca/app/uploads/Academic-Integrity-Policy-1-1.pdf).”

## Policy on use of generative AI

Students may freely use generative AI in this course so long as the use of generative AI is referenced and cited as below. Some assignments may require the use (and critique) of generative AI tools. Use of generative AI outside assessment guidelines or without citation will constitute academic dishonesty. It is the student’s responsibility to be clear on the expectations for citation and reference and to do so appropriately.

#### Example citation

“[Generative AI tool]. (YYYY/MM/DD of prompt). “Text of prompt”. Generated using [Name of Tool.] Website of tool”

e.g. “ChatGPT4. (2023/05/31). “Suggest a cookie recipe that combines oatmeal, chocolates chips, eggs and sugar.” Generated using OpenAI’s ChatGPT. [https://chat.opeani.com](https://chat.opeani.com/)”

### Academic Property Statement

Students may make audio recordings of lectures for personal use only. Except for course material marked with a Creative Commons license, no part of the Biology 4AE3 lectures, course information, tests or test answer keys may be reproduced or redistributed, in any form (including all forms of audio or video recording and all file formats) or by any means (including uploading to any commercial web site), without permission in writing from the instructor.

## Virtual Course Delivery

We do not expect there to be a virtual component to the course. However, in the unlikely event that some components are online and synchronous **it is expected that you have reliable access to the following:**

1. A computer that meets performance requirements [found here](https://cto.mcmaster.ca/technology-resources-for-mcmaster-students/" \l "tab-content-device-recommendations).
2. An internet connection that is fast enough to stream video.
3. Computer accessories that enable class participation, such as a microphone, speakers and webcam when needed.

If you think that you will not be able to meet these requirements, please contact [uts@mcmaster.ca](mailto:uts@mcmaster.ca) as soon as you can. Please visit the [Technology Resources for Students page](https://cto.mcmaster.ca/technology-resources-for-mcmaster-students/" \l "tab-content-device-recommendations) for detailed requirements. If you use assistive technology or believe that our platforms might be a barrier to participating, please contact [Student Accessibility Services](https://sas.mcmaster.ca/), [sas@mcmaster.ca](mailto:sas@mcmaster.ca), for support.

### Requests for Relief for Missed Academic Term Work (MSAF Policy)

[McMaster Student Absence Form (MSAF):](https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/msaf-mcmaster-student-absence-form/) In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar “Requests for Relief for Missed Academic Term Work”. Students should expect to have academic commitments Monday through Saturday, but not on Sunday or statutory holidays.

#### MSAF Type A: Mosaic online self-reporting tool

**A type A MSAF should be used for absences lasting up to three calendar days for missed work worth less than 25%.** Using the McMaster student absence form (MSAF) on-line, self-reporting tool in the Mosaic student center, undergraduate students may report absences lasting up to three calendar days and may also request relief for missed academic work. The submission of medical or other types of supporting documentation is normally not required. Students may use this tool to submit a maximum of one request for relief of missed academic work per term. Students must immediately follow up with their course instructors regarding the nature of the relief. Failure to do so may negate the opportunity for relief. It is the prerogative of the instructor of the course to determine the appropriate relief for missed term work in their course. The MSAF on-line, self-reporting tool cannot be used to apply for relief from any course work that is equal to or greater than 25% of the final grade, or any final examination or its equivalent. See *Petitions for Special Consideration* in this section of the Calendar.

#### MSAF Type B: Faculty-approved MSAF filed through your Associate Dean's Office

A type B MSAF must be used **for** work valued at or above 25%, for **absences lasting more than three calendar days**, **or for the reporting of more than one request for relief per term.** Students who meet any one of these conditions cannot use the on-line, self-reporting tool on Mosaic to request relief. They MUST report to the Office of Associate Dean of their respective Faculty to discuss their situation and may be required to provide supporting documentation. If the petition is approved, the Office of Associate Dean of student’s respective Faculty will notify the instructor(s) recommending relief. The student must contact the Course Coordinator promptly to discuss the appropriate relief. Failure to do so may negate the opportunity for relief. It is the prerogative of the instructional team of the course to determine the appropriate relief for missed term work in their course.

## Email Etiquette

Communication via [Piazza](https://piazza.com/) is preferred for this course, but e-mail is also acceptable. Always send course-related email from your McMaster University email account; if you use another email address, such as Gmail, your email might be ignored. Always (1) include “Biology 4AE3” in the subject line; (2) begin your email with a salutation (e.g. “Dear Dr. Bolker”); (3) always end your email with your full name and your McMaster student number. Responses to Piazza notes or e-mails may take up to 24 hours, not including weekends.

## Academic Skills

Some times during your university studies can be challenging. For students who wish to improve their academic skills, study habits, time management, or for specialized services for learning-challenged students and English as a second language (ESL) students, assistance is available at both the Student Success Centre located in Gilmour Hall 110 <https://studentsuccess.mcmaster.ca/>, and at the Student Accessibility Services located the lower level (basement) of the McMaster University Student Centre B107 <https://sas.mcmaster.ca/>

## McMaster University Grading Scheme

Grades obtained for Biology 4AE3 will be converted according to the following scheme, which is the one in general use at McMaster University.

|  |  |  |
| --- | --- | --- |
| **Grade** | **Points** | **Equivalent Percentages** |
| A+ | 12 | 90-100 |
| A | 11 | 85-89 |
| A- | 10 | 80-84 |
| B+ | 9 | 77-79 |
| B | 8 | 73-76 |
| B- | 7 | 70-72 |
| C+ | 6 | 67-69 |
| C | 5 | 63-66 |
| C- | 4 | 60-62 |
| D+ | 3 | 57-59 |
| D | 2 | 53-56 |
| D- | 1 | 50-52 |
| F | 0 | 0-49 |

# McMaster Policies and **Procedures**

## Academic Accommodation of Students with Disabilities

Students with disabilities who require academic accommodation must contact [Student Accessibility Services (SAS](https://sas.mcmaster.ca/)) at 905-525-9140 ext. 28652 or [sas@mcmaster.ca](mailto:sas@mcmaster.ca) to make arrangements with a Program Coordinator. For further information, consult McMaster University’s [Academic Accommodation of Students with Disabilities](https://secretariat.mcmaster.ca/app/uploads/Academic-Accommodations-Policy.pdf) policy.

## Academic Accommodation for Religious, Indigenous or Spiritual Observances (RISO)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the [RISO](https://secretariat.mcmaster.ca/app/uploads/2019/02/Academic-Accommodation-for-Religious-Indigenous-and-Spiritual-Observances-Policy-on.pdf) policy. Students should submit their request to their Faculty Office **normally within 10 working days** of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

## Courses with An On-Line Element

**Some courses** **may**use on-line elements (e.g. e-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure, please discuss this with the course instructor.

## Online Proctoring

**Some courses may**use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

## 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.

**It is your responsibility to understand what constitutes academic dishonesty.**

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. For information on the various types of academic dishonesty please refer to the [Academic Integrity Policy](https://secretariat.mcmaster.ca/app/uploads/Academic-Integrity-Policy-1-1.pdf), [located at University Secretariat website.](https://secretariat.mcmaster.ca/university-policies-procedures- guidelines/)

**The following illustrates only three forms of academic dishonesty:**

* plagiarism, e.g. the submission of work that is not one’s own or for which other credit has been obtained.
* improper collaboration in group work.
* copying or using unauthorized aids in tests and examinations.

## Authenticity / Plagiarism Detection

**Some courses may** use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. **All submitted work is subject to normal verification that standards of academic integrity have been upheld** (e.g., on-line search, other software, etc.). For more details about McMaster’s use of Turnitin.com please go to the [McMaster Office of Academic Integrity](https://www.mcmaster.ca/academicintegrity/)’s webpage.

## Conduct Expectations

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all our living, learning and working communities. These expectations are described in the [Code of Student Rights & Responsibilities (the “Code”).](https://secretariat.mcmaster.ca/app/uploads/Code-of-Student-Rights-and-Responsibilities.pdf) All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, **whether in person or online**.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students’ access to these platforms.

## Copyright and Recording

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, **including lectures** by University instructors.

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

## Extreme Circumstances

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.