

# Microbial Eukaryotes Syllabus

## Department of Biology

BIOL 3102 [10340 + 10341/10342] Fall 2025

*Dalhousie University acknowledges that we are in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq People and pays respect to the Indigenous knowledges held by the Mi'kmaq People, and to the wisdom of their Elders past and present. The Mi'kmaq People signed Peace and Friendship Treaties with the Crown, and section 35 of the Constitution Act, 1982 recognizes and affirms Aboriginal and Treaty rights. We are all Treaty people.*

*Dalhousie University also acknowledges the histories, contributions, and legacies of African Nova Scotians, who have been here for over 400 years.*

### Course Instructor

| Name             | Email                   | Office Hours  |
|------------------|-------------------------|---|
| Alastair Simpson | alastair.simpson@dal.ca | Email to arrange in-person meeting (or a virtual meeting via Zoom, Teams, or Phone):<br>Preferred times: Mon 12-4 pm or Wed 12-2 pm |

### Course Description

Microbial eukaryotes are of tremendous ecological, evolutionary and medical/veterinary importance. This course provides a comprehensive understanding of the biodiversity and evolution of both algal and protozoan eukaryotes, and examines important aspects of their organismal biology, including cell and genome organization, life histories, trophic strategies, locomotion and symbiosis.

#### Course Prerequisites

BIOL 2020.03 (or BIOA 2001.03) and BIOL 2004.03 (or MICI 2100.03)

#### Course Exclusions

None

### Student Resources

I am always happy to meet about the course: Please email to arrange an in-person meeting (or a virtual meeting via Zoom, Teams, or Phone). Preferred times are Mon 12-4 pm & Wed 12-2 pm

## Course Structure

### *Course Delivery*

In-person; Lectures will not normally be recorded.

### *Lectures*

Monday and Wednesday 10:35-11:25; Life Sciences Centre Room C334

Friday 10:35-12:25; Life Sciences Centre Room C244  
(unless superseded by a lab – *see Course Content*)

### *Laboratories*

Friday 10:35-12:25 (Section 1) OR 12:35-14:25 (Section 2)  
(4 Fridays only: *see Course Content*)  
Life Sciences Centre, Biology Wing (LSCB), Room B4016

## Course Materials

The course is divided into three sequential ‘parts’. For all parts, the material for the course is that which is covered in the lectures (and lab exercises). There is no single textbook or course pack for this course. The following resources will be made available instead:

- 1) The lecture slides will be made available online **after** each lecture, **in edited form** (so you should take notes during lectures themselves).
- 2) There will be supplementary notes for most (but not all) of the lectures, especially in Parts 1 and 2 (lectures 1-16; see **course content**, below). These will be made available online in .pdf format gradually, before the relevant lecture(s).
- 3) There will be a small number of short readings (e.g. review papers) that you will be expected to read during the course. This is mainly in Part 3 of the course (lectures 17-22; see **course content**, below) These will be provided in class or online prior to the relevant lecture.
- 4) Handout/worksheets for each **lab exercise** (see above) will be provided as paper copies, free of charge. They will also be archived online.
- 5) The “Handbook of the Protists” edited by Archibald, Simpson and Slamovits (2017) is available from the Dalhousie Libraries as an e-book. It is an *optional* resource, especially for Part 1 of the course.

The course Brightspace site (<https://dal.brightspace.com/d2l/home/392942>) is the primary management tool for the course. All the course materials listed above, except (5), will be housed here.



## Course Policies on Missed or Late Academic Requirements

*Late Assignments:* The due dates for lab assignments will normally be the Friday following lab, unless otherwise posted on the lab worksheet. Late assignments will be penalised 0.5 marks (typically out of 6) for every part or whole week late, *and* any commitments made by the instructor to return the marked assignment by a certain date (e.g. prior to a test) will not apply.

*Missed Test (Tests 1 and 2):* For Tests 1 and 2, the policy for rescheduling a missed test, or not, will be as follows:

*A student requesting an alternative time shall be granted that request only in exceptional circumstances. Such circumstances include illness (with student declaration of absence – SDA, or medical certificate) or other mitigating circumstances outside the control of the student. Varsity sport is an example of a legitimate circumstance, providing reasonable prior warning (a week or more) is given to the instructor. Elective arrangements, such as travel plans, are not considered acceptable grounds for granting an alternative examination time. Using an SDA twice or more during the course will be referred to the Assistant Dean for Student Affairs to ensure your wellbeing.*

*Missed Test (Test 3):* For Test 3, there will be a rescheduled test automatically available for anyone who does not take Test 3 at the scheduled time. SDAs or similar documentation will **not** be required. The time and date will be announced closer to the end of semester.

*Missed Quizzes:* ‘Quizzes’ cannot be taken after the original date due to absence. Please note, however, that only your 7 best quiz marks will count to your final grade, so up to 3 quizzes can be missed without reducing your maximum possible mark for the course.

*Cancelled classes:* If a lecture is cancelled due to weather etc. it will normally be given in the next available lecture slot. The remaining lecture schedule will be adjusted as needed.

In the event that a lab has to be cancelled, we will similarly attempt to shift the lab schedule (including adding an extra Friday to the lab schedule), which likely will involve also changing the lecture schedule. If it is impossible to reschedule a lab, the other lab assignments will be evenly reweighted such that the total lab mark remains as 24% of the total course mark.

## Course Policies related to Academic Integrity

*Policy on Collaboration:* This policy is relevant for the completion of the **lab reports**. Some of the actual laboratory work is inherently collaborative (examples; students working in pairs to prepare material; the entire class making similar measurements then sharing them to generate larger datasets). However, unless explicitly stated otherwise in the worksheet, all components of all lab reports are to be done individually, and will be marked as the individual work of the student submitting the report.

Artificial Intelligence (AI) is not to be used to write lab reports. The ‘ethical test’ for using AI is this; do not use the output of AI in a situation in which it would be academic misconduct and/or unethical to use work by another actual person. AI-generated summaries in response prompts (and the like) are not citable items – go to the original sources.

Plagiarism software will not be used in this class.

## Learning Objectives

- Describe the basic biology of the most important major groups of microbial eukaryotes.
- Describe the nature and role of the cytoskeleton in microbial eukaryotes (esp. flagellar apparatus, including replication)
- Explain the composition and synthesis of several important types of mineralised scales and tests of microbial eukaryotes
- Explain, and contrast the cellular basis and relevant hydrodynamic considerations for major forms of i) swimming, ii) gliding and iii) amoeboid locomotion by microbial eukaryotes.
- Describe and contrast major feeding modes for phagotrophic microbial eukaryotes.
- Understand the functions of major structures/life history stages often represented specifically in microbial eukaryotes (e.g. extrusomes, cysts)
- Describe the functions of major types of mitochondrion-related organelles in anaerobic eukaryotes.
- Contrast primary, secondary and tertiary plastid endosymbiosis, including the evolutionary pattern of occurrence, and protein targeting.
- Describe the basic evolutionary tree, and early evolutionary history, of eukaryotes; further, show understanding of major unresolved questions in eukaryote evolution.

## Course Content and Projected Timetable

|             | Date          | Day             | Time                   | Activity  | Quiz?         |
|-------------|---------------|-----------------|------------------------|---|---------------|
| <b>Sept</b> | 24            | Wed             | 10:35-11:25            | Lecture 1: Intro; background euk diversity        |               |
|             | 26            | Fri             | 10:35-12:25            | Lecture 2: Archaeplastida, 'Minor' algae          | (practice)    |
|             | 29            | Mon             | 10:35-11:25            | Lecture 3: Stramenopiles 1                        | Quiz 1        |
| <b>Oct</b>  | 1             | Wed             | 10:35-11:25            | Lecture 4: Stramenopiles 2                        |               |
|             | 3             | Fri             | 10:35-12:25            | Lecture 5: Alveolates                             |               |
|             | 6             | Mon             | 10:35-11:25            | Lecture 6: Rhizaria                               | Quiz 2        |
|             | 8             | Wed             | 10:35-11:25            | Lecture 7: Amoebozoa, Opisthokonts                |               |
|             | <b>10</b>     | <b>Fri</b>      | <b>10:35 or 12:25</b>  | <b>LAB EXERCISE 1</b>                             |               |
|             | 13            | Mon             | <i>Dal closed</i>      | <i>None - Thanksgiving</i>                        |               |
|             | 15            | Wed             | 10:35-11:25            | Lecture 8: "Excavates"                            | <b>Quiz 3</b> |
|             | 17            | Fri             | <b>10:35-12:25</b>     | <b>Guest Lecture – Parasitism (Smith; Acadia)</b> |               |
|             | 20            | Mon             | 10:35-11:25            | <b>TEST 1</b>                                     | Quiz 4        |
|             | 22            | Wed             | 10:35-11:25            | Lecture 9: Form 1                                 |               |
|             | <b>24</b>     | <b>Fri</b>      | <b>10:35 or 12:35</b>  | <b>LAB EXERCISE 2</b>                             |               |
|             | 27            | Mon             | 10:35-11:25            | Lecture 10: Form 2                                | Quiz 5        |
|             | 29            | Wed             | 10:35-11:25            | Lecture 11: Form 3                                |               |
|             | 31            | Fri             | 10:35-12:25            | Lecture 12: Motility 1                            |               |
| <b>Nov</b>  | 3             | Mon             | 10:35-11:25            | Lecture 13: Motility 2                            | Quiz 6        |
|             | 5             | Wed             | 10:35-11:25            | Lecture 14: Feeding 1                             |               |
|             | <b>7</b>      | <b>Fri</b>      | <b>10:35-12:25</b>     | <b>LAB EXERCISE 3</b>                             |               |
|             | 10            | Mon             | <i>Dal closed</i>      | <i>None – Remembrance</i>                         |               |
|             | 12            | Wed             | No classes             | Study break                                       |               |
|             | 14            | Fri             | No classes             | Study break                                       |               |
|             | 17            | Mon             | 10:35-11:25            | Lecture 15: Feeding 2; Extrusomes                 | Quiz 7        |
|             | 19            | Wed             | 10:35-11:25            | Lecture 16: Miscellaneous                         |               |
|             | <b>21</b>     | <b>Fri</b>      | <b>10:35-12:25</b>     | <b>TEST 2</b>                                     | <b>Quiz 8</b> |
|             | 24            | Mon             | 10:35-11:25            | Lecture 17: Intro. to protist evolution           |               |
|             | 26            | Wed             | 10:35-11:25            | Lecture 18: Ancient origin & Fossils              |               |
|             | <b>28</b>     | <b>Fri</b>      | <b>10:35-12:25</b>     | <b>LAB EXERCISE 4</b>                             |               |
| <b>Dec</b>  | 1             | Mon             | 10:35-11:25            | Lecture 19: Mitochondria,                         | Quiz 9        |
|             | 3             | Wed             | 10:35-11:25            | Lecture 20: Mito (cont); other symbioses          |               |
|             | 5             | Fri             | 10:35-12:25            | Lecture 21: Plastids                              |               |
|             | 8             | Mon             | 10:35-11:25            | Lecture 22: Special topic 1                       | Quiz 10       |
|             | <b>10</b>     | <b>Wed</b>      | <b>10:35-11:25</b>     | <b>TEST 3</b>                                     |               |
|             | <del>XX</del> | <del>Fri</del>  | <del>10:35-12:25</del> | <del>XXXX</del>                                   |               |
|             | <del>XX</del> | <del>Mon</del>  | <del>10:35-11:25</del> | <del>XXXX</del>                                   |               |
|             | <del>XX</del> | <del>Tues</del> | <del>10:35-11:25</del> | <del>XXXX</del>                                   |               |
|             | <del>XX</del> | <del>Wed</del>  | <del>10:35-11:25</del> | <del>XXXX</del>                                   |               |

## University Policies and Statements

### **Recognition of Mi'kmaq Territory**

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel, and support. Visit or e-mail the Indigenous Student Centre at 1321 Edward St or [elders@dal.ca](mailto:elders@dal.ca). Additional information regarding the Indigenous Student Centre can be found at: [https://www.dal.ca/campus\\_life/communities/indigenous.html](https://www.dal.ca/campus_life/communities/indigenous.html)

### **Internationalization**

At Dalhousie, 'thinking and acting globally' enhances the quality and impact of education, supporting learning that is "interdisciplinary, cross-cultural, global in reach, and orientated toward solving problems that extend across national borders." Additional internationalization information can be found at: <https://www.dal.ca/about-dal/internationalization.html>

### **Academic Integrity**

At Dalhousie University, we are guided in all our work by the values of academic integrity: honesty, trust, fairness, responsibility, and respect. As a student, you are required to demonstrate these values in all the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity. Additional academic integrity information can be found at: [https://www.dal.ca/dept/university\\_secretariat/academic-integrity.html](https://www.dal.ca/dept/university_secretariat/academic-integrity.html)

### **Accessibility**

The Student Accessibility Centre is Dalhousie's centre of expertise for matters related to student accessibility and accommodation. If there are aspects of the design, instruction, and/or experiences within this course (online or in-person) that result in barriers to your inclusion, please contact the Student Accessibility Centre ([https://www.dal.ca/campus\\_life/academic-support/accessibility.html](https://www.dal.ca/campus_life/academic-support/accessibility.html)) for all courses offered by Dalhousie with the exception of Truro. For courses offered by the Faculty of Agriculture, please contact the Student Success Centre in Truro (<https://www.dal.ca/about-dal/agricultural-campus/student-success-centre.html>)

## **Conduct in the Classroom – Culture of Respect**

Substantial and constructive dialogue on challenging issues is an important part of academic inquiry and exchange. It requires willingness to listen and tolerance of opposing points of view. Consideration of individual differences and alternative viewpoints is required of all class members, towards each other, towards instructors, and towards guest speakers. While expressions of differing perspectives are welcome and encouraged, the words and language used should remain within acceptable bounds of civility and respect.

## **Diversity and Inclusion – Culture of Respect**

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness (Strategic Priority 5.2). Additional diversity and inclusion information can be found at:

<http://www.dal.ca/cultureofrespect.html>

## **Student Code of Conduct**

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner - perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution. The full Code of Student Conduct can be found at:

[https://www.dal.ca/dept/university\\_secretariat/policies/student-life/code-of-student-conduct.html](https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html)

## **Fair Dealing Policy**

The Dalhousie University Fair Dealing Policy provides guidance for the limited use of copyright protected material without the risk of infringement and without having to seek the permission of copyright owners. It is intended to provide a balance between the rights of creators and the rights of users at Dalhousie. Additional information regarding the Fair Dealing Policy can be found at:

[https://www.dal.ca/dept/university\\_secretariat/policies/academic/fair-dealing-policy-.html](https://www.dal.ca/dept/university_secretariat/policies/academic/fair-dealing-policy-.html)

## **Originality Checking Software**

The course instructor may use Dalhousie's approved originality checking software and Google to check the originality of any work submitted for credit, in accordance with the Student Submission of Assignments and Use of Originality Checking Software Policy. Students are free, without penalty of grade, to choose an alternative method of attesting to the authenticity of their work and must inform the instructor no later than the last day to add/drop classes of their intent to choose an alternate method. Additional information regarding Originality Checking Software can be found at: [https://www.dal.ca/dept/university\\_secretariat/policies/academic/student-submission-of-assignments-and-use-of-originality-checking-software-policy-.html](https://www.dal.ca/dept/university_secretariat/policies/academic/student-submission-of-assignments-and-use-of-originality-checking-software-policy-.html)

## **Student Use of Course Materials**

Course materials are designed for use as part of this course at Dalhousie University and are the property of the instructor unless otherwise stated. Third party copyrighted materials (such as books, journal articles, music, videos, etc.) have either been licensed for use in this course or fall under an exception or limitation in Canadian Copyright law. Copying this course material for distribution (e.g. uploading to a commercial third-party website) may lead to a violation of Copyright law.