# Molecular Evolution

## Course Information

**Instructor:** Abigail Lind (abigail.lind@gatech.edu)
**Course Prefix and Number:** BIOS 4225 A, 3 credits
**Term:** Fall 2026

## Course Description

This course covers the principles and methods of molecular evolution, with an emphasis on understanding how and why DNA and protein sequences change over time. Topics include models of nucleotide and protein substitution, molecular phylogenetics and evolutionary inference, and comparative genomics and genome evolution.

## Course Learning Outcomes

1. **Learn and apply molecular evolutionary models and approaches**
    - Understand and apply key models of nucleotide and amino acid substitution to different types of molecular data
    - Understand and apply principles of phylogenetic tree reconstructin
    - Understand and apply comparative methods for evolutionary inference
2. **Learn new knowledge in the fields of molecular and genome evolution**
    - Integrate findings from modern -omics research into evolutionary context
    - Understand how genome-scale data are used to study molecular evolution
3. **Read and critically analyze scientific literature**
    - Read, critically evaluate, and synthesize primary scientific literature in molecular and genome evolution
    - Identify strengths, limitations, and assumptions in published research
4. **Present research to peers**
    - Deliver professional scientific presentations and lead peer discussions

## Required Course Materials

No textbooks or materials are required.

Suggested textbooks (available from the instructor and from Georgia Tech library):

- *Fundamentals of Molecular Evolution* by Graur & Li. Sinauer Associates. ISBN: 0878932666
- *Molecular Evolution and Phylogenetics* by Nei & Kumar. Oxford University Press. ISBN: 0195135849

## Grading Policy

This course is graded on a letter grade basis. The grade will be assigned based on the following components:

| Component | Weight |
|---|---|
| Paper Summaries / Critiques | 20% |
| Midterm Exam (open note) | 25% |
| Student Presentation(s) | 25% |
| Final Exam (open note) | 30% |

Letter grade scale:

- A: 90–100%
- B: 80–89%
- C: 70–79%
- D: 60–69%
- F: 0–59%

Paper summaries/Critiques:

Papers to be discussed in class should be read by all students prior to the relevant session. Each student must submit a one-page summary/critique of assigned papers before the start of class. Critiques submitted on time (before class begins) receive full credit; late submissions receive no credit. Critiques that simply copy or paraphrase the abstract will receive a zero.

Presentations:

Students are required to present one or more papers from the course paper list and lead a follow-up discussion. Graduate students are expected to give at least two presentations; undergraduate students are expected to give one. Presentation length will be 15–25 minutes depending on the scope of the paper. Students are encouraged to consult the instructor with a draft presentation beforehand, and will receive written graded feedback after presenting.

Exams:

There will be two exams: a midterm and a final. Both are open-book and open-note; however, electronic devices (laptops, phones, tablets) are not permitted. Exams cover all material discussed in the course, including lectures, papers, and discussions. Any two exams that appear substantially similar will both receive a grade of zero.

## Attendance Policy

Regular attendance and active participation are essential to the format of this course. Students are allowed one unexcused absence. Additional absence may be excused by advance notice to the instructor or after the event with appropriate documentation. Because a significant portion of the course involves student-led presentations and peer discussion, missing these sessions has a direct impact on course performance and the learning environment for all students.

## Academic and Research Honesty/Integrity Statement

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review the Student Code of Conduct and the Academic Honor Code, especially Appendix A: Graduate Addendum to the Academic Honor Code.

Students are expected to perform research in an ethical and responsible manner.

Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Allegations of scientific or scholarly misconduct are handled in accordance with the procedures outlined by the Policy for Responding to Allegations of Scientific or Other Scholarly Misconduct.

## Core IMPACTS

Not applicable

## Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

## Student-Faculty Expectations

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. The Student-Faculty Expectations articulates some basic expectations that you can have of me and that I have of you. Additional information for research-related work is given in The Expectations of Advisors and Advisees. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.