

Spring Semester, 2022
BIOS 4590 A
Research Project Lab

This syllabus is subject to change.

Course mode and collective responsibility for learning and health

Welcome to BIOS 4590! As one of the final courses in the Biology major, this course is one of your last opportunities to interact with peers and faculty who will remain part of your professional network throughout your career. I hope we can all agree that the best way grow relationships and learn is face-to-face. Unfortunately, infection rates could necessitate a change in delivery mode at any time. Whether we meet in-person versus remotely could change depending upon health status of individuals in the classroom. You have a definite stake in your personal health and the community's health and taking a layered approach has been shown to be effective in mitigating spread.

Layered approach:

- 1) Everyone who is eligible should be vaccinated and boosted; vaccination significantly reduces likelihood of severe disease, including from the omicron variant of SARS-CoV-2.
- 2) Because the omicron variant can be spread by vaccinated individuals, I also expect that everyone should wear a mask, correctly covering mouth and nose, when in the classroom.
- 3) Georgia Tech has improved airflow and filtration in classroom buildings.
- 4) We will spread out as much as possible in our classroom.
- 5) Weekly asymptomatic surveillance testing should be part of everyone's regular routine, regardless of vaccination status. Pick a time each week to get tested, and book it into your calendar. Details are here:
<https://health.gatech.edu/coronavirus/testing>.

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Office hours: By appointment via Bluejeans. Please note that there will always be plenty of opportunities to ask questions during lab.

Course Objectives: Students will gain experience in designing, implementing, and communicating a biology research project, and practical training in modern approaches for biological research. This section will have a scientific theme of **Molecular and Structural Biology Research Using Bioinformatics and Computational Biology Approaches**. Following initial experiments to obtain hands-on knowledge and training in methods, students will design and carry out a research project, communicating the overall goal and

results in an end-of-semester manuscript and poster presentation, as well as in the Communicating Biological Research class.

Lecture – Mon 12:30-1:20 PM, Room 487, Clough UG Learning Commons Bldg

Laboratory – Wed 12:30-3:15 PM and Wed 3:30-6:15 PM, Room 487, Clough UG Learning Commons Bldg

Unfortunately, food and drinks are NOT allowed in classroom 487!

BIOS 4590 is a 3-credit lab-based course. BIOS 4460 (Communicating Biological Research) is a co-requisite for BIOS 4590 because students will present their research from BIOL 4590 in Communicating Biological Research. Students enrolled in BIOS 4590 can sign up for any section of BIOS 4460 as long as it occurs during the same semester.

Because this is a lab-based course, attendance and active participation are required. We expect absences to be rare, and each unexcused lab absence will lower your final grade by 5%. Examples of excusable absences include documented illness, death in the family, accident, and sanctioned Institute events. If you know that you are going to be absent from a lab, you must let the instructor know ahead of time. Unexcused absences from lecture sessions will lower the course participation grade.

It is *not* acceptable to use cell phones in class or during the lab.

Office Hours:

By appointment. Please, use your Georgia Tech email account with the course number in the subject line. We cannot answer emails from other accounts (hotmail, gmail, etc.). We will also have plenty of opportunities to talk during the class and lab.

Textbook (Optional):

A textbook is not needed. Published scientific papers are the best examples for writing your own manuscripts. In case you absolutely would love to read a book, you could read the one below, or another book on the same topic.

Writing Papers in the Biological Sciences by Victoria E. McMillan (5th edition), Bedford/St. Martin's, Boston/NY, 2012. Approx. \$20-\$30.

Additional sources on methods:

Bioinformatics, biology, biochemistry, and biophysics journals.

Grading.

Evaluation is based on student research and the ability to communicate that research in writing:

Research portion (evidence that research is being conducted effectively) 40%:

Attendance	15%
Quality of Notebooks	5%
Written Reports on Planned Experiments	10% each

Scientific writing portion (evidence that student can communicate research) 60%:

Research Proposal	10%
Preliminary Manuscript	15%
Final Manuscript	35%

Notebooks.

Your notebooks should be handwritten in ink and should include original notes you take during or immediately after experiments and preparatory notes. They are evaluated individually (each student is required to present his/her own notebook). Your notebooks should contain description of the procedures you have performed, and actual/original data. It is not necessary to rewrite the protocols (you may attach them if you wish to) in your notebooks. However, it ought to outline experimental steps so that a person (including yourself) should be able to follow and repeat your experiments without reference to the original detailed procedures. In addition, it is required that you include all the changes made to planned protocols as well as all calculations, measurements/observations, etc. Students who want their notebooks back should make requests no later than one month after the completion of the course. Notebooks remaining beyond that point will be regarded as unwanted and discarded.

Written reports on planned experiments: Each student should turn in a written report for experiments I and experiment II even though they will work in teams in obtaining the data in the experiments. These reports should be **no more than 3-4 pages of text in addition to figures, calculations, and references. They should be written in a manuscript style with an introduction, results section and discussion.** See for example, articles in Proceedings of National Academy of Sciences & instruction to authors (<http://www.pnas.org/site/misc/iforc.shtml#submission>).

Independent Projects Pairs of students will choose a project in consultation with instructors. Discussion of possible projects will occur throughout the initial phase of the course, and will be discussed in more detail two weeks before the projects begin.

Project Proposal: This will be no more than a **two-page (single spaced, Arial 11-point font)** description of the research to be conducted. The proposal should include background and justification of the project, what experiments will be conducted and interpreted and how the expected results will relate to the overall goal of the research area. Although students will work in pairs, **each student will write their own proposal.**

Preliminary manuscripts: consist of the introduction and methods sections of the manuscript related to the student's research project, written in the style of the journal ***Journal of Structural Biology***. The **introduction should be no more than 4 pages (double-spaced, Arial 11-point font) and should include the background, justification, and goals for the research project. Citations should be included in-text and listed at the end of the preliminary manuscript and are not included in the page limit.** Feedback from the instructor can then be used to improve the introduction and methods for re-submission as part of the

final manuscript. If students are working in groups, **each student will write his or her own preliminary manuscript.**

Final Project Manuscript: Final manuscripts will be in the style of the journal *Journal of Structural Biology* and should be **no more than 10 pages (double-spaced, Arial 11-point font), plus figures, tables, and citations.** The final manuscript must include an abstract, introduction, methods, results, and discussion. Data should be appropriately summarized and provided in tables and/or figures with appropriate legends, as modeled in the journal. There is no limit on the number of citations used. **Although the research will be conducted by pairs of students each student will write his or her manuscript independently.** The results and materials and methods section can be the same for each team. The introduction and discussion sections must be independently written.

Academic Integrity: Academic dishonesty will not be tolerated. Students are reminded of the obligations and expectations associated with the Georgia Tech Academic Honor Code and Student Code of Conduct, available online at www.honor.gatech.edu. While students will collaborate in performing the experiments and collecting the data, each student is expected to write his or her own notebooks and manuscripts, including creating his or her own tables and figures. Plagiarism includes reprinting the words or ideas of others without citation. As direct quotes are seldom used in scientific writing, you are expected to rephrase the words of others and provide the citation. If this is unclear, please ask your instructor or TAs for help as you write before turning in your assignment.

Please see www.honor.gatech.edu for Georgia Tech's Academic Honor Code, which you are required to uphold.

Learning accommodations:

Classroom accommodations will be made for students with disabilities to participate fully in the course activities and meet course requirements. These accommodations must be arranged in advance in accordance with the Office of Disability Services: <http://disabilityservices.gatech.edu>

Tentative Schedule Spring 2022.

Due dates for Exercise 1 and Experiments 1 & 2 will be discussed.

Week 1, 1/10	Discussion of course; introduction to Experiment I
Week 2, 1/17	MLK Day (January 17) Lecture (Wed): Protein structure; Methods in structural biology Lab: Exercise I - Structural Biology.
Week 3, 1/24	Lecture: Databases I Lab: Experiment I - Structural Biology; project discussion with lab partner and/or instructors.
Week 4, 1/31	Lecture: Discussion of research projects & initiation I Lab Experiment II - Molecular Biology. Review of notebooks – Wed.
Week 5, 2/7	Lecture: Discussion of research projects & initiation I

	Lab Experiment II - Molecular Biology; project discussion with lab partner and/or instructors. Proposal due
Week 6, 2/14	Lecture: Discussion of research projects & initiation II Lab: Independent project preparation and background data
Week 7, 2/21	Lecture: Discussion of research projects Lab: Independent project preparation and background data
<i>Weeks 8-15</i>	<i>Independent projects. Mondays: 12:30-1:20 PM for discussing issues, problems, etc.</i>
Week 8, 2/28	Lecture: Discussion of research projects Lab: independent lab projects.
Week 9, 3/7	Lecture: Discussion of research projects Lab: independent lab projects. Preliminary manuscript – Wed.
Week 10 3/14	Lecture: Discussion of research projects Lab: independent lab projects
Week 11 3/21	Spring break
Week 12 3/28	Lecture: Discussion of research projects Lab: independent lab projects. Review of notebooks – Wed.
Week 13 4/4	Lecture: Discussion of research projects; Write up research papers. Lab: independent lab projects
Week 14 4/11	Lecture: Discussion of research projects; Write up research papers. Lab: independent lab projects
Week 15 4/18 4/21	Last week of lab. Prepare Posters <u>Final Papers Due 4/20</u> Poster session (Tuesday 4/26 at 4:30-6pm).