

**Independent Research Project**  
**BIOL 4690**  
**Spring 2016; Jan 11 - May 05**

**SECTION A, SP16 (3 credit hours)**

**Biology Instructor of Record:** Dr. Michael Goodisman (michael.goodisman@biology.gatech.edu) 404-385-6311; Cherry Emerson #A110. Office hours: By appointment.

**Course description:** Students will gain experience in designing, implementing, and communicating a biology research project, and practical training in modern approaches for biological research. Your research project will be designed, implemented, and analyzed in collaboration with the faculty mentor you have identified.

BIOL 4690 is a 3-credit research-based course. BIOL 4460 (Communicating Biological Research) can be taken concurrently or in the subsequent semester, because students will present their research from BIOL 4690 in 4460. Students are required to have a minimum of 1 credit of BIOL 2698/2699/4698/4699 prior to enrolling in BIOL 4690. If you are completing BIOL 4690 to complete the Research Option through the Undergraduate Research Opportunities Program, you will need to complete LCC 4701 pre-requisite and LCC 4702 co-requisite.

**Class Administration:** BIOL 4690 students technically have two supervisors, the ‘research supervisor’ and the ‘School of Biology supervisor/Instructor of Record’. The research supervisor will be the Principal Investigator who oversees the student in their research throughout the semester (practically, students may work with graduate students or postdocs on a day-to-day basis). The research supervisor will serve as the primary director and assessor of the student during the research. The student is expected to work closely with the research supervisor regarding all activities. In addition, the research supervisor will work with the student to develop the reports, to assess the quality of those reports, and to assign an overall grade at the end of the semester.

In contrast, the Biology supervisor will act as the administrative manager of the program. Thus student contact with the Biology supervisor will likely be more limited to emails, contacts through T-square, and perhaps a few meetings during the semester. *However, students are encouraged to contact the Biology supervisor at any time, particularly if there are any concerns, issues, questions, or problems regarding the research.* The Biology supervisor will help to ensure that the research proceeds properly for all parties involved.

**Student Expectations:**

- 1) The student prepares a short proposal of the research project within the first few weeks of the semester, graded by the research mentor.
- 2) The student works throughout the semester on their project (~9 hr per week), with help from others in the lab group when needed, but the project should be run by the undergrad student.
- 3) The student prepares a draft manuscript in the second half of the semester to be graded by the faculty mentor.
- 4) The student writes a final manuscript on the research in the style of a relevant scientific journal, graded by the faculty mentor *and by one additional faculty member* chosen by the student and mentor, who agrees to play this role. The manuscript should be submitted to the instructor and second reader at the beginning of the final week of classes.
- 5) At the end of the semester, a copy of the student’s manuscript must be submitted for review to the Instructor of Record for BIOL 4690, in order to approve the student’s research as counting for the Senior Research Experience.

**Lab safety:** Georgia Tech has a strict policy regarding appropriate clothing in laboratories where chemicals and organisms are used or manipulated. Students not conforming with the following requirements will be asked to leave the lab to acquire appropriate clothing. In the laboratory, students must wear

- 1) **Long pants.**
- 2) **Close-toed shoes** that cover the sides and top of the foot.
- 3) **Lab coats**, when working at the bench. Lab coats must be 100% cotton and cover the wearer to the knees. Students are responsible for keeping their lab coats in good condition and reasonably clean so as to not create a hazard.
- 4) **Safety glasses**, when working at the bench. Safety glasses must have side shields for splash protection and conform to the wearer's face. Glasses must be worn over prescription glasses and contact lenses. Georgia Tech Biology provides safety glasses for student use in the lab. Safety glasses prevent eye exposure to liquid reagents and breakables, as well as dangerous substances such as bacteria, toxins, acids or UV light.

**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%
Scientific writing portion (evidence that student can communicate research)	
Research Proposal	10%
Preliminary Manuscript	15%
Final Manuscript	35%

All written documents should be single-spaced, 12-point font, with 1 inch margins on all sides.

**Research Proposals** consist of a short plan of the project to be conducted. The proposal should be 1-2 pages long and include: a title, introductory background and justification, hypotheses, experimental design, data analysis, statement of expected results, and how the results relate to the introduction. In addition, the proposal should contain at least five citations in-text, and include a journal-style literature cited section (not included in the page limit).

**Preliminary manuscripts:** Contents should be arranged with the faculty mentor, and should comprise draft elements of the final manuscript related to the student's research project. In general, the preliminary manuscript should be ~3 pages long and include the background, justification, and goals for the research project. Elements of the methods, results, and discussion may be included depending on how far the project has advanced. The preliminary manuscript should include at least 5 citations in-text and include a journal-style literature cited section listed at the end of the manuscript not included in the page limit. Feedback from the instructor can then be used to improve the style and content for re-submission as part of the final manuscript.

**Final manuscripts:** Should be ~7 pages, and include figures, tables, and at least 10 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 legends, as modeled in the journal. Each student will write his or her own final manuscript.

**Spring 2016 Report Due Dates:**

Research Proposals: February 5, 2016

Preliminary Manuscript: March 18, 2016

Final Manuscript: April 22, 2016

**Readers:** Final manuscripts should be read by the faculty mentor and a second faculty reader. Student and faculty mentor should consult and agree on a second faculty reader, and the student should seek agreement by email from the second reader, at least one month prior to the end of the semester. The student should email the final manuscript to the second reader at the same time that s/he submits it to the faculty mentor. The second reader will read the student work and then communicate a recommended grade to the faculty mentor within 1 week. The faculty mentor is responsible for communicating the student grade to the student and submitting the final grade to the Instructor of Record for BIOL 4690. The student will receive a written evaluation from the faculty mentor at the end of the semester summarizing the strengths and weaknesses of the project.

**Academic Integrity:** Academic dishonesty will not be tolerated. This includes cheating, lying about course matters, plagiarism, stealing classroom materials, or helping others commit a violation of the Honor Code. 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](http://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.

**Learning Accommodations:** Please contact the instructors during the first week of class or as soon as possible if you need classroom accommodations. Accommodations should be arranged in advance and in accordance with the Office of Disability Services (<http://disabilityservices.gatech.edu/>)