



## Biology Undergraduate Research for Credit (Biology 499R)

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### Overview

Laboratory research can be a pivotal experience in your undergraduate career. Whether joining a lab for the first time or continuing projects that you have already started, this semester you will learn something new. You may gain insight about the scientific process, about the natural world or about yourself. **This**

**course is like no other course. You will be expected to commit to independent research. Integrity, honesty, self-motivation and diligence are key.** Ask questions. Enjoy!

While your main commitment in this course is based on your work on your research project, there are several mandatory assignments along the way, leading to a mandatory research report. Details are below.

## Learning Objectives

Biology 499R is intended to provide students structured support as they develop, conduct and present biology-related research. You may work on independent or collaborative research projects. Projects may involve wet lab research, clinical research, bioinformatics, modeling or meta-analyses. Some projects may be more qualitative than others. In all cases, **the work should be driven by a question or set of questions related to the biological sciences**. Students cannot, for example, be learning techniques without the goal of applying those to a defined project later, nor can they write a literature review. As research can be slow, it is fine if you do not get to the point of finishing the project within the semester. However, regardless of the stage of your project, you will be expected to produce a final research manuscript (Fall) or research poster (spring). After this semester's research experience, you should be better able to:

- Plan and conduct authentic experiments, and/or critically evaluate experimental data.
- Perform self-motivated experimental research
- Actively participate in scientific discussions with a critical approach to the research
- Write a research paper and present hypotheses and/or results in a professional way
- Define ethical standards and academic integrity in the research process
- Describe and adjust to the unpredictabilities, the unexpected challenges, and the unknowns that are a common part of conducting research

## Course Director



### **Dr. Nicole Gerardo**

- Professor, Department of Biology
- Email: [nicole.gerardo@emory.edu](mailto:nicole.gerardo@emory.edu)
- Office Hours: by appointment
  - Zoom (Meeting ID: 973 2952 0340, Passcode: research)
  - In person, 1111 O Wayne Rollins

Mentoring students in research is one of the most rewarding, important aspects of my career. My goal is to facilitate your independent research experience. Some reasons to reach out to me would be:

- If expectations for the course are unclear
- If you are having trouble interacting with your mentor(s) or others in your lab.
- If you are having trouble meeting obligations of the program, which include 12-16 hours per week working on your project, reading and writing.
- If you need to withdraw from the course.
- If you are interested in other research opportunities and would like some advice.
- If you need help with assignments, or additional feedback on your written work and figures
- If you have questions about graduate school or other career paths

## **Overview of Assignments**

**See Course Schedule, below, for due dates.**

**Most assignments are due on a Thursday. As each assignment is helping you build knowledge and accomplish goals. To this end:**

- **Assignments will not receive full credit if more than 3 days late, unless permission to submit it late was requested in advance of the due date (not on the due date or after) due to illness or a situation beyond your control.**
- **Assignments turned in more than two weeks late will receive a grade of zero. Exemptions to this policy will be extremely limited.**

*Mentor-Mentee Agreement. 2pts.*

- Together with one of your mentors, you will discuss expectations and plans for the semester. You include these in an agreement document.

*Finding and Organizing References. 2pts*

- Reading literature relevant to your research is key to building an understanding of how your research is contributing to scientific knowledge. To have a comprehensive understanding, you need to be able to find related research articles.
- Reference management software helps researchers organize and quickly cite the literature that they read. You will use provided resources to set up reference management software on your computer (if you have not already done so).
- You will be required to include a screen shot of a reference software package on your computer with references in it.

*Summarizing Research Articles and Linking to Your Research. 2pts*

- You will summarize two research articles related to your work and then provide an overview of how they inform your work.
- You can use AI to help generate the summaries.

*How to Write a Compelling Abstract. 2pts*

- You will do a short assignment to practice your abstract writing. Once you submit it, you will be given several examples to compare against.

*An Introduction Scaffold. 2pts*

- You will answer a set of questions to help you define what should be included in your introduction.

*Draft of Abstract and Introduction. 2pts*

- You will receive 3pts for turning in a complete abstract and introduction, with references in the appropriate format, on time.
- References will need to be inserted using reference management software.

*Peer Review of Draft Abstract and Introduction. 2pts.*

- You will receive 2pts of a thorough peer review of one fellow student's report. You will be randomly assigned to someone for peer review.

*Outline of Project Report. 2pts*

- You will receive 2pts for turning in a complete outline by the target due date.

*Draft Research Report to Mentor(s) for Feedback. 2pts.*

- You will be required to send a draft of your research report to your advisor at least 10 days before the final report is due.

*Final Research Report. Satisfactory/Unsatisfactory*

- Satisfactory is based on turning in a complete, well-written report on time. We will assess:
  - the completeness of all sections
  - appropriate formatting based on provided guidelines
  - whether the writing is sufficiently clear
  - whether all text and figures are appropriately referenced and attributed.
- Your final report must be approved by your advisor. You will sign the front page saying that they read and approved it.
- We will grade your report as complete (satisfactory) or incomplete (unsatisfactory). If you receive an unsatisfactory, you will receive one letter grade lower in the course than that tabulated based on your mentor grade and other assignments. We will meet in the first week of the spring semester to discuss necessary revisions. If you complete necessary revisions, I will raise your grade to that listed in canvas. If I have concerns of plagiarism or incomplete citations (in the text or in reference to figures

not generated by you), I will determine the appropriate course of action. Plagiarism will be reported to the honor council.

- Your research mentor will consider the quality of this report in determining the grade they assign you.

*Research Mentor Grade. 150pts*

- The majority of your grade will be determined by your faculty research mentor. I will email your research mentor towards the end of the semester asking for them to email me your grade. If I do not receive the grade, you will receive an incomplete for the course.
- Your grade is not based on your findings. Science experiments don't always work the first time, and science is not about getting the answer that you wanted. **Your grade will be based on your faculty mentor considering the following questions:**
  - Did the research student in your lab make progress? Did they develop a project and attempt experiments or analyses?
  - Was the research student reliable?
  - Did the research student work on their project at least 12-16 hours per week. Please consider time spent reading and working on their final presentation?
  - Did the research student ask for assistance when needed and respond to feedback appropriately?
  - Did the research student communicate effectively?
  - How was the quality of your students' final research report? Please remember for a first semester student that they may not yet have data.
- In addition, your research mentor will be given the following criteria to help in their decision:

	A	A-/ B+	B/B-	C to F	Proficiency Measured By:
Progress/Effort	Excellent	Excellent, possibly a minor concern	Meets most criteria	Substantial deficiencies	Meets deadlines related to goals of project when reasonable. Meets expectations for attendance in lab and participation in lab activities. Helps others in lab where appropriate.
Scholarship	Excellent	Excellent, possibly a minor concern	Meets most criteria	Substantial deficiencies	Generates thorough and reproducible records of experiments. Able to describe goals and results of experiments. Written report is clear and presents the research in the context of the greater field. Responds to and incorporates

					feedback on research and writing.
Communication/ Ethics	Excellent	Excellent, possibly a minor concern	Meets most criteria	Substantial deficiencies	Clear communication, attends meetings with mentor(s), communicates effectively with other members of research team(s); upholds ethical standards, including standards of data integrity.

<b>A</b>	Excellent progress towards established goals. Excellent communication, both verbal and written. Reliable. Conscientious.
<b>A-</b>	Excellent progress towards established goals, with some minor concerns about other grading criteria (communication, reliability, conscientiousness).
<b>B+</b>	Some concerns about progress towards goals or other key criteria.
<b>B to B-</b>	Concerns about progress towards established goals and about one or more of the other grading criteria.
<b>C to F</b>	Substantial concerns about meeting expectations and communication.

### Final Grades

- If your final report is considered incomplete, you will receive one letter grade lower than your grade posted in canvas. You will then have an opportunity to revise your report and raise your grade. Assuming you are not graduating, this can be completed in the spring semester.
- I will not change a grade if it contradicts the grade provided by your mentor.
- Should you be concerned about the grade your mentor assigned you, the first thing to do is to try to arrange a conversation with them about the basis for the grade and your concerns. I recommend that you try to have a conversation on zoom or in person rather than to discuss this via email only. Should that not resolve your concerns, please contact me. We can set up a meeting with all three or us, and we can include your direct mentor if appropriate.
- Letter grade cut-offs:
  - A                      93.3 or more
  - A-                     90 to 93.2

B+	87.7 to 89.9
B	83.3 to 87.6
B-	80 to 83.2

## **Accessibility and Accommodations**

As the instructor of this course, I want every student to have the support that they need to succeed within their research environment. The Department of Accessibility Services (DAS) works with students who have disabilities to provide reasonable accommodations. It is your responsibility to request accommodations. In order to receive consideration for reasonable accommodations, you must **register with the DAS (<https://accessibility.emory.edu/students/>)**. Accommodations cannot be retroactively applied, so you need to contact DAS as early as possible and contact me as early as possible in the semester to discuss the plan for implementation of your accommodations. For additional information about accessibility and accommodations, please contact the Department of Accessibility Services at (404) 727-9877 or **[accessibility@emory.edu \(mailto:accessibility@emory.edu\)](mailto:accessibility@emory.edu)**.

Many accommodations that students have for other courses (e.g., extra time for exams) may not be relevant for Biol 499r. However, you should consider the nature of what you best need to be supported in a research setting. As best as possible, while filling out the mentor-mentee agreement, be open about your needs with your mentor(s). Feel free to reach out to me (Dr. Gerardo) if you have any questions or would like to discuss more.

## **Getting Help with Writing**

Scientific writing, like all writing, is hard. Scientific writing may also be quite different than other writing that you have done in the past.

- The Emory Writing Center (EWC) is available to support student writers on a range of a projects, including scientific research manuscripts and reports. EWC tutors are trained to meet with writers of all levels, at any stage of the writing process, from brainstorming to final revisions. Tutors do not proofread or edit, but instead share skills and resources through dialogue and inquiry; they guide writers to revise and edit their own work. EWC services are available in multiple languages, and several tutors are ELL Specialists trained to support English Language Learners. Please visit their website to learn more and to make an appointment: **<http://www.writingcenter.emory.edu/>** (**<http://www.writingcenter.emory.edu/>**)
- Give your mentors sufficient time to give you feedback on your writing. Set up a schedule of when you will submit draft to them for comment.

## Honor Code

The honor code is in effect throughout the semester, and applies to your conduct in your research just as it applies to your conduct in a classroom. By taking this course, you affirm that it is a violation of the code to plagiarize, to give false information to a faculty member, and to undertake any other form of academic misconduct, which includes scientific misconduct. You also affirm that if you witness others violating the code you have a duty to report them to the honor council.

**The following are examples of honor code violations associated with this course:**

- falsifying data.
- providing false information to the course instructor or any research mentor.
- using any text from a published research article, a grant or paper draft written by someone other than yourself in any assignment unless you have prior consent from the course instructor to collaborate on your research report.
- intentionally inappropriately referencing the research of others in any assignment.
- unintentionally plagiarizing or inappropriately referencing the writing or research of others because of use of AI.
- using AI to generate content without express permission on any writing assignment, including any component of a Biol 499R research paper, talk or poster. Note, you may use AI tools to edit content.

**For more Honor Code Info:**

<http://catalog.college.emory.edu/academic/policies-regulations/honor-code.html>

## Course Schedule

Here, I provide a detailed list of suggestions for what you should be doing each week. Please overview this schedule with your mentors. All assignments and their due dates are in bold.

**Most assignments are due on a Thursday.**

August 28 to September 13	<ul style="list-style-type: none"><li>• <b>Overview of Course Expectations and Meet the Course Director (Optional).</b> These optional sessions will include a short presentation overviewing the goals of the research program and the assignments. You will also have an opportunity to ask specific questions of Nicole Gerardo, the course director. Each session is the same, so there is no need to come to all three.<ul style="list-style-type: none"><li>◦ <b>Session 1.</b> Thursday, September 12. 12:30 to 1:00PM. Zoom. (Meeting ID: 973 2952 0340, Passcode: research)</li><li>◦ <b>Session 2.</b> Thursday, September 12. 5:30 to 6:00PM. Zoom. (Meeting ID: 973 2952 0340, Passcode: research)</li></ul></li></ul>
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	<ul style="list-style-type: none"> <li>◦ <b>Session 3.</b> Friday, September 13. 3:00 to 3:30PM. Zoom. (Meeting ID: 973 2952 0340, Passcode: research)</li> <li>• Make sure to finalize a meeting schedule with your direct mentor and try to have a first meeting of the semester. You need to meet with your mentor at least once a week.</li> <li>• <b>Fill out your mentor-mentee agreement with your advisor, or schedule time to do so before the September 19th due date.</b></li> <li>• Ask your research mentor(s) for papers that you should read.</li> <li>• Ask your research mentor(s) if they are having a weekly lab meetings. If so, try to attend each week.</li> <li>• Ask your research mentor(s) if there are any seminars that you should attend.</li> <li>• Start your research</li> </ul>
September 16 to September 20	<ul style="list-style-type: none"> <li>• Meet with your mentor at least once this week.</li> <li>• Read at least two primary literature articles related to your research this week.</li> <li>• Continue your Research Project</li> <li>• Submit your completed <b>Mentor-Mentee Agreement.</b> <ul style="list-style-type: none"> <li>◦ <b>Due Date September 19</b></li> </ul> </li> </ul>
September 23 to September 27	<ul style="list-style-type: none"> <li>• Meet with your mentor at least once this week.</li> <li>• Read at least two primary literature articles related to your research this week.</li> <li>• Continue your Research Project</li> <li>• Down load the <a href="https://canvas.emory.edu/courses/135427/files/12636592?wrap=1">Biol 499R report template</a> (<a href="https://canvas.emory.edu/courses/135427/files/12636592?wrap=1">https://canvas.emory.edu/courses/135427/files/12636592?wrap=1</a>) ↓ (<a href="https://canvas.emory.edu/courses/135427/files/12636592/download?download_frd=1">https://canvas.emory.edu/courses/135427/files/12636592/download?download_frd=1</a>) and read about all the research report sections. Discuss this template with your mentor.</li> <li>• If you don't already have it, set up a Reference Manager, including a plug in so that you can 'cite while you write' in Word of Google Docs. If your lab has no preference, use Zotero, as it's free and common. More information can be found on the <a href="https://canvas.emory.edu/courses/135427/pages/getting-the-most-from-scientific-references">References</a> (<a href="https://canvas.emory.edu/courses/135427/pages/getting-the-most-from-scientific-references">https://canvas.emory.edu/courses/135427/pages/getting-the-most-from-scientific-references</a>)_page of our canvas site.</li> <li>• Complete the <b>Finding and Organizing References</b> assignment <ul style="list-style-type: none"> <li>◦ <b>Due Date: September 26</b></li> </ul> </li> </ul>
September 30 to October 4	<ul style="list-style-type: none"> <li>• Meet with your mentor at least once this week.</li> <li>• Read at least two primary literature articles related to your research this week.</li> <li>• Continue your Research Project</li> <li>• Complete <b>Summarizing the Literature and Linking to Your Research</b> <ul style="list-style-type: none"> <li>◦ <b>Due Date: October 3</b></li> </ul> </li> </ul>
October 7 to October 11	<ul style="list-style-type: none"> <li>• Meet with your mentor at least once this week.</li> <li>• Makes plans with your mentor if you will be away for Fall Break.</li> <li>• Read at least two primary literature articles related to your research this week.</li> <li>• Continue your Research Project</li> </ul>

	<ul style="list-style-type: none"> <li>• Complete the <b>How to Write an Abstract</b> assignment <ul style="list-style-type: none"> <li>◦ <b>Due Date: October 10</b></li> </ul> </li> </ul>
October 14 to October 15	Fall Break
October 14 to October 18	<ul style="list-style-type: none"> <li>• Read at least two primary literature articles related to your research this week.</li> <li>• Continue your Research Project</li> </ul>
October 21 to October 25	<ul style="list-style-type: none"> <li>• Meet with your mentor at least once this week.</li> <li>• Read at least two primary literature articles related to your research this week.</li> <li>• Continue your Research Project</li> <li>• If you plan on continuing in Biol 499R in the spring, check the announcements for details on how to register.</li> <li>• Complete the <b>Introduction Scaffold</b> assignment <ul style="list-style-type: none"> <li>◦ <b>Due Date: October 24</b></li> </ul> </li> </ul>
October 28 to November 1	<ul style="list-style-type: none"> <li>• Meet with your mentor at least once this week.</li> <li>• Read at least two primary literature articles related to your research this week.</li> <li>• Continue your Research Project</li> </ul>
November 4 to November 8	<ul style="list-style-type: none"> <li>• Meet with your mentor at least once this week.</li> <li>• Read at least two primary literature articles related to your research this week.</li> <li>• Continue your Research Project</li> <li>• , Complete the <b>Draft Abstract and Introduction (with references) Assignment</b> <ul style="list-style-type: none"> <li>◦ <b>Due Date: November 7</b></li> </ul> </li> </ul>
November 11 to November 15	<ul style="list-style-type: none"> <li>• Meet with your mentor at least once this week.</li> <li>• Read at least two primary literature articles related to your research this week.</li> <li>• Continue your Research Project</li> <li>• Try to complete the <b>Peer Review of Draft Abstract and Introduction Assignment (due next week)</b></li> <li>• Work on your <b>Outline (due next week)</b></li> </ul>
November 18 to November 22	<ul style="list-style-type: none"> <li>• Meet with your mentor at least once this week.</li> <li>• Read at least two primary literature articles related to your research this week.</li> <li>• Continue your Research Project, incorporating any feedback you received from peers.</li> <li>• Make any plans necessary with your mentor to account for Thanksgiving break.</li> <li>• Complete the <b>Outline Assignment</b> <ul style="list-style-type: none"> <li>◦ Due Date: November 21</li> </ul> </li> <li>• Complete the <b>Peer Review of Draft Abstract and Introduction Assignment</b> <ul style="list-style-type: none"> <li>◦ Due Date: November 21</li> </ul> </li> </ul>

November 25 to November 29	<ul style="list-style-type: none"> <li>• Thanksgiving Break (November 27-29)</li> <li>• Work on your report.</li> <li>• Continue your research if appropriate.</li> </ul>
December 2 to December 6	<ul style="list-style-type: none"> <li>• Meet with your mentor at least once this week.</li> <li>• Continue your Research Project</li> <li>• Complete the <b>Send Draft to Mentor Assignment</b> <ul style="list-style-type: none"> <li>◦ <b>Due December 5</b></li> <li>◦ <b>Make sure to let your mentor know that the final research paper is due December 10.</b></li> </ul> </li> </ul>
December 10	Last Day of Classes
December 9 to December 13	<ul style="list-style-type: none"> <li>• Have final meeting with your mentor to discuss how your project went, where you can improve and what next steps are.</li> <li>• Finalize your report.</li> <li>• Turn in your <b>Final Report</b> <ul style="list-style-type: none"> <li>◦ <b>Due Date: Friday, December 12</b></li> </ul> </li> </ul>
December 14	<ul style="list-style-type: none"> <li>• Research Mentor Grade Due (I will be contacting them directly to ask for your grade. You do not need to do anything.)</li> </ul>
December 20	Official End of Fall Term