Georgia Institute of Technology
NEUR 4001: Neuroscience Research Project
CRISPR in Neurobiology (Instructor: Stolfi)
Capstone Course, Fall 2026

Class time & location:
Lecture component: W/F 11:00-11:50 AM (Boggs 1-21)
Lab component: W/F 12:30-3:15 PM (Boggs 1-21)

Prerequisites: NEUR 3010

Instructor and TA office hours and contact information are listed on the Canvas course page.

Course Description & Learning Objectives

The purpose of this course is to familiarize you to the methods and processes used by neuroscientists to generate scientific research. More specifically, we will be using CRISPR/Cas9 technology to probe gene function in the nervous system of tunicates, our closest invertebrate relatives. Over the course of the semester, you will gain an understanding of the process of research – from generating research questions, developing a testable hypothesis, evaluating the existing literature, data collection and analysis, interpretation of results, and communicating findings to others in oral and written form. **Our main objective is to increase your confidence in scientific literacy to help you as a consumer and generator of knowledge in life and in your future profession.**

At the end of the semester, you will be able to:

- Articulate strengths and limitations of various research designs
- Locate and utilize primary literature to identify experimental designs and essential background information
- Formulate testable research hypotheses and generate tests or experiments based on operational definitions of variables
- Follow the APA Code of Ethics in the treatment of human and nonhuman participants in the design, data collection, interpretation, and reporting of neuroscientific research and follow proper biosafety procedures
- Evaluate the appropriateness of conclusions derived from research outcomes
- Identify when and where to use specific statistical tests and interpret basic statistical results
- Communicate scientific knowledge in written, graphical, and oral format and recognize importance of accurate reporting of methods and data for replication studies
- Critically evaluate classmates' research design and presentations
- Work collaboratively toward shared research goals

Course Requirements

Required readings
There is no textbook for this course. This syllabus is required reading. As per the objectives of the course, each student will identify their own reading material in the form of papers that are relevant to their research experiments of choice.

Computer and Internet
A computer and a stable internet connection are required to be able to access course materials and to submit assignments. Please contact us if you need any assistance in accessing the course.
Communication
This class will communicate via Canvas and through your Georgia Tech email address. Please check your GT email address regularly so you do not miss any updates and announcements. **If not emailing directly via Canvas, please indicate your course and section number in the subject line.** The instructor and/or TA will do their best to reply to your emails within 24 hours during the school week. **To stay organized, we will not accept assignments via email**. We would like for you to have a support system for this course, so please communicate with your classmates, instructor, and TA early and often.

Canvas and Student Technology Support
This course utilizes Canvas, a virtual learning management system. Canvas is compatible with all browsers and works with your phone. You may consider downloading the app for your phone to receive notifications and alerts for your courses. Verify your email settings are set to forward your GT email address, and make sure you are receiving emails from the system.
GT Canvas site: https://canvas.gatech.edu/
GT Canvas app for students: https://community.canvaslms.com/t5/Canvas-Basics-Guide/What-is-the-Canvas-Student-app/ta-p/31

Need Microsoft Office? Get access to the FREE cloud-based version of Office 365 by visiting the GT Office 365 website and using your GT email address.
GT Office 365 Website: http://portal.office.com

Need tech help? Contact the Office of Instructional Technology with any technology questions or connect in the Virtual Help Desk.
Office of Instructional Technology website: https://oit.gatech.edu/
Email: support@oit.gatech.edu
Phone: 404-385-5555

Course Policies
Make-up Policy
Late assignments will lose 10% per day off the final grade and will not be accepted after one week past the due date. For extensive illnesses and emergencies, contact the Office of the Vice President and Dean of Students who can inform and work with your instructors.
https://studentlife.gatech.edu/request-assistance

Federal Regulations on financial aid require all faculty to document last date of attendance for students who are not participating in classes. If a student has stopped participating in class, then the student's name must be sent to the Dean of Students. If prolonged illness or death in the family occurs, speak with the instructor about withdrawing from the class. In extreme conditions an incomplete may be approved at the discretion of the instructor using guidelines outlined by the Office of the Registrar.

Attendance Policy
This course is a hands-on lab course, and students are expected to fully participate and engage each week. In-class participation is calculated as part of your final grade (see grading table below). The instructor will work with students who have obtained Institute Approved Absences (IAAs) or official

documentation from the Dean of Students to provide reasonable accommodations for missed work when possible.

Course Engagement
Student engagement in coursework and class activities is essential for learning and student success. In addition, to comply with federal mandates related to financial aid, the university is required to track attendance and engagement in course activities. Meaningful engagement in a course goes beyond logging into Canvas and may include engaging with learning materials, participating in learning activities, completing assessments, and interacting with classmates and/or the instructor. You are expected to be actively engaged in the course activities explained in this syllabus, just as the instructor and TA promise to be actively engaged, as well. To maintain professionalism and ensure positive interactions and continued collaboration within your group, it is critical that you communicate timely with your group members to inform them of any absence or tardiness.

Academic Honesty and Integrity
Your instructors take academic integrity very seriously. Cheating, in any form, interferes with your success. As science is collaborative by nature, you are absolutely permitted to discuss ideas, results, and work with other people. However, **all work you submit must be your own and in your own words**. If you turn in another's work as your own, **including AI-generated material**, you should expect a failing grade for the course. Work on individual assignments should be done independently. If you have any questions about anything, please do not hesitate to reach out to the instructor or TA. We are here to help!

Policy on use of generative AI for class work
AI-based assistance, such as ChatGPT or Copilot, is considered unauthorized collaboration in this course when used in lieu of writing and interpreting in your own words. In your assignments, do not use anything that was not written directly by you. Including anything you did not write in your assignment without proper citation will be treated as an academic misconduct case and will be reported to the Office of Student Integrity. Use any interaction with an AI assistant as a *tool* to promote your learning experience, with your completed submitted product reflecting your interpretation and understanding of the material. https://www.cc.gatech.edu/news/new-policies-navigate-role-ai-assistants-cs-courses

GT Academic Honor Code
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 Georgia Tech's Honor Code and the student Code of Conduct. Any student suspected of cheating or plagiarism 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.

Georgia Tech Values Statement
At Georgia Tech, we see different backgrounds and perspectives as essential to learning, discovery, and creation. We strive to remove barriers to student success, and to build a welcoming community where everyone has the opportunity to contribute to our mission. As outlined in our strategic plan (https://strategicplan.gatech.edu/values), we want to create an environment of holistic learning where all individuals can grow and learn to lead healthy, purposeful, impactful lives.

Student-Faculty Expectations Agreement
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 articulate some basic expectations that you can have of me and that I have of

you. 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.

Accommodations for Students with Disabilities
If there are aspects of the instruction or design of this course that result in barriers to your inclusion or accurate assessment of achievement, please notify me as soon as possible so we can resolve the issue. Students with disabilities should also contact the Office of Disability Services (ODS), whose purpose is to collaborate with students, faculty, and staff to create a campus environment that ensures all students have an equal opportunity to access the Georgia Tech community. ODS can be reached at 404.894.2563, dsinfo@gatech.edu, or https://disabilityservices.gatech.edu. Please contact me ahead of time to discuss any issues related to disabilities. I am happy to work with you.

Office of Disability Services:
Smithgall Student Services Building
Email: dsinfo@gatech.edu
Phone: 404-894-2563
Website: http://disabilityservices.gatech.edu/

How to succeed in this class

Science is collaborative, innovative, and also kind of hard sometimes! Experiments do not always go as planned, and we should never set out to "prove" our hypotheses. Negative data, confusing data, no data – these are all possible (if not, probable) outcomes for some of our experiments this semester. Your success in this class will not be judged by the outcome of your experiments, but by your participation, creativity, determination, and communication. We will work together throughout the semester, and your success will depend on your willingness to engage deeply with the research and work in collaboration with your partners.

Assignment		**Points**
Research Project – Written (375 pts)	Topic/Hypothesis/Predictions	25
	Annotated Bibliography	50
	Draft: Intro and Methods	50
	Draft: Results and Figures	50
	Final Research Paper	200
Research Project – Oral Presentation (275 pts)	Proposal Presentation	100
	Response to Peer Feedback	25
	Final Project Presentation	150
Journal Club Presentations	Presentation	75
Peer-review of proposal presentations	In-class worksheet	50
Peer-review of final presentations	In-class worksheet	50
Course reflections	In-class worksheet	25
Participation	Attendance and in-class participation	150
TOTAL		**1000**

Grading Scale - Your final grade will be assigned as a letter grade according to the following scale:
A 900-1000 points
B 800-899 points
C 700-799 points
D 600-699 points

F 0-599 points

Extra Credit
If an extra credit opportunity arises, we will inform you. **To be fair to all students, we cannot offer extra credit to an individual student that has not been offered to the entire class.**

Proposed Schedule will be posted on Canvas and is subject to change; any changes will be posted on Canvas and announced in class. **All deadlines are 3:15pm Eastern on Canvas unless otherwise noted.**

Assessment of your learning

Research Project: Throughout the semester, you will work on a neuroscience research project related to the development of the tunicate larval nervous system, using CRISPR/Cas9-mediated mutagenesis as your major experimental approach to probing gene function. You will be working as part of a team of 3-4 students to gain realistic research experience, as researchers tend to work as part of a research team. As a group, you will decide on a topic, propose your topic, collect data, analyze it using the correct statistical analyses, and present your findings in oral and written form. The topic will be somewhat constrained by the experimental approaches and data collection instrumentation available to you. These will be made clear by the instructor(s), who will work together with you to draft realistic experimental plans given these constraints. You will submit drafts of specific sections of the project throughout the semester and receive feedback from your instructors/TAs and peers. As a group, you will present your proposal and final presentation to the class to gain experience presenting to a scientific audience (**see in-class presentation dates**). Finally, individually you will turn in a full APA-style manuscript of your research findings. More details will be provided throughout the semester **(see due dates; submit via Canvas)**. To reiterate, **generative AI should not be used for any assignment and will be penalized with a zero on the assignment and reported to the Office of Student Integrity.**

Written Components:
Topic/hypothesis/predictions (group activity): In 2-4 sentences, broadly explain your research question, testable hypothesis, and predictions.

Annotated Bibliography (group activity): Students will provide an in-depth literature review that provides enough information on the background and previous research done on your topic of interest. **You should include a minimum of 5 references per person** from academic journals for this assignment, but plan to add more, especially for the final manuscript. Explanations for each reference can be in bulleted format.

Introduction and Methods (individual activity): To assist you with the process of writing your manuscript, each student will submit a detailed Introduction and Methods section before submitting their final manuscript**.**

Results and Figures (individual activity): To assist you with the process of writing your manuscript, each student will submit their Results section with figures before submitting their final manuscript.

Final manuscript (individual activity): The capstone course is designed to be a culmination of all of your coursework and learning at Tech. We would like to assess **individual learning** through your final manuscript. This individual assessment is a common practice not just in capstone courses at Tech, but

at many institutions. Being able to write in your own words and integrate information is an important skill for any graduate to have.

Peer-review feedback forms (individual activity): To assist you with practicing peer-review, each student will fill out peer-review worksheets in class, after each proposal or final presentation. For the proposal presentation, peer reviews received must be responded to and incorporated in the final presentation (see below).

Oral Components:

Research Proposal Presentation (group activity): Each group will present their proposals to the class and will get feedback from instructors and peers. The proposal will comprise of their major research question, hypotheses, brief background, methods, expected results, and limitations. This presentation will be approximately 20 minutes in duration plus time for questions. You will submit as a group a written response on how you plan to address feedback in your final presentation.

Final Presentation (group activity): Each group will give a 20-minute presentation of their experimental results, including the background and significance, the hypothesis, the methods used, and the interpretation of the results.

Journal club presentation (group activity): Each group will consult with the instructor to select an original, empirical research paper (not review!) related to their research topic and lead a discussion of the main points in a "journal club" style discussion with their peers (up to 20 minutes duration). This is intended to foster critical analysis of research papers and helps prepare for the remaining oral and written assignments.

Reflection (individual activity): At the conclusion of the semester, you will be asked to submit a short (approximately 300 words) reflection expressing what you learned from conducting a capstone research project and what you think you might do differently if you had to do it over again.

Participation (individual activity): Participation is crucial in this intensive, research-based course. You are expected to attend the lecture and lab portions of this course for a truly engaging experience. Attendance is a large part of your participation grade and tardiness will be deducted from your attendance points. It is essential to engage with your lab partners and your instructors in-person and remotely to complete the tasks assigned and troubleshoot any problems. If you think of additional questions off-hours, or if it is your preference, you can always e-mail the instructor(s).

Academic and Personal Support

APA Style resource: http://owl.english.purdue.edu/owl/resource/560/01/

Center for Academic Success: http://success.gatech.edu

- 1-to-1 tutoring: https://success.gatech.edu/tutoring/
- Peer-Led Undergraduate Study (PLUS): https://success.gatech.edu/tutoring/plus/
- Academic coaching: https://advising.gatech.edu/academic-coaching
- Communication Center: http://www.communicationcenter.gatech.edu
  - Individualized help with writing and multimedia projects

Student Mental Health and Wellbeing: Georgia Tech is committed to supporting and advancing the mental health and well-being of our students. If you or someone you know has a history of mental health concerns, is having current mental health difficulties, or if you are unsure and would like a consultation, a variety of confidential services are available.

National Suicide Prevention Hotline at 988.

The Office of the Dean of Students: https://studentlife.gatech.edu/dean-students/
Smithgall Student Services Building 2nd floor
Email: studentlife@studentlife.gatech.edu
Phone: 404-894-6367

Counseling Center: http://mentalhealth.gatech.edu
Smithgall Student Services Building 2nd floor
Phone: 404-894-2575

- Services include short-term individual counseling, group counseling, couples counseling, testing and assessment, referral services, and crisis intervention.
- Their website also includes links to state and national resources.
- *Students in crisis may walk in during business hours (8am-5pm, Monday through Friday) or contact the counselor on call after hours at **404-894-2575**.*

Belonging and Student Support: http://belonging.gatech.edu/studentsupport

Students' Temporary Assistance and Resources (STAR): https://star.studentlife.gatech.edu/

- Can assist with interview clothing, food, and housing needs.

Stamps Health Services: https://health.gatech.edu
740 Ferst Dr NW, Atlanta, GA 30332
Phone: 404-894-1420

- Primary care, pharmacy, women's health, psychiatry, immunization and allergy, health promotion, and nutrition

Veteran's Resource Center: http://veterans.gatech.edu/
Phone: 404-385-2067

Georgia Tech Police: 404-894-2500

Non-Discrimination: Georgia Institute of Technology is committed to equal opportunity, a culture of inclusion, and an environment free from discrimination and harassment in its educational programs and employment.

Equal Opportunity, Compliance, and Conflict Management: https://eoc.gatech.edu/
RBI Paper Tricentennial Building, 4th floor
Phone: 404-894-5698