**BIOS 2611: Integrative Genetics Project Laboratory – Syllabus – Fall 2018**

**Sections**: Section A Thursday 12:00-2:40 or Section B Thursday 3:00-5:40

**Classroom**: CE 123 (located on the ground floor of Cherry Emerson in the SW corner)

**Prerequisites**: BIOS 1107 AND (BIOS 1107L OR BIOS 1207L) OR BIOL 1510 OR BIOL 1511

**Co-requisite**: BIOS 2610 is a co-requisite. You must take these courses simultaneously.

**Course Description:**

This course is designed for exceptional students interested in learning important concepts and practical techniques in the field of genetics. Integrative Genetics Project Lab is project-based, where students will design and conduct a laboratory experiment aimed at exploring aspects of transmission genetics, population genetics, and molecular genetics using the Georgia Tech Urban Honey Bee Project and neighboring hives. As with all research, we will begin with a question and then follow the scientific method to generate a hypothesis, design and conduct an experiment, and analyze the data to draw a conclusion. Because we’ll be exploring new questions to Atlanta’s urban honey bee populations, we’ll probably also bump into the primary frustrations of scientific research—assays that require troubleshooting, delays when protocols don’t work perfectly at first pass, and results that don’t match our thinking about the system. We'll do this because asking real questions in a relevant study system is what scientists do, and learning how to navigate the process and solve the ensuing problems is the best training you can have  for your senior research experience and to pursue careers in scientific research, medicine & human health, or other fields that require problem solving and logic.

By the end of this course, you will be able to:

1. Generate and craft a thorough, genetics-based hypotheses about European Honey Bees.
2. Design experiments and interpret results using basic statistical analysis.
3. Create and troubleshoot genetics lab protocols.
4. Cite relevant genetics primary literature.
5. Write effective and accurate notebook entries, and lab reports in the style accepted by genetics scientific journals.
6. Use appropriate bench techniques, following all lab safety standards.

While this laboratory is the co-required companion to BIOS 2610, your grade in each course is independently earned. This course is 1.0 credit hour. You are expected to work for 3 full hours in lab each week, and for the additional time required to complete your lab prep and assignments.

**Instructor**:

Dr. Chrissy Spencer

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Office location: CULC 474C

Office Hours: Wed 2pm-4pm

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**Teaching Assistants**:

Maria Granada

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Office hours: EBB 4th floor lobby by appointment on most weekdays 12-7 pm

Taylor Niehoff

Email: [tniehoff3@gatech.edu](mailto:tniehoff3@gatech.edu)

Office hours: EBB 3rd floor lobby on Monday 12-1 pm and Wednesday 10-11 am and by appointment

**Schedule:** Honors Genetics Lab meets every Thursday from 8/23 through 11/29 except *11/22 (Thanksgiving Holiday)*. A final lab report, grant proposal, video, and/or presentation will be due during the last full week of classes. Because of the project-based nature of this course, we will set the schedule for each week based on the progress made in the week before. Expect a small writing or reading assignment each week and a PreLab due on Canvas every week. Consult [bio2355.biosci.gatech.edu/bee-project-f18-schedule/](http://bio2355.biosci.gatech.edu/bee-project-f18-schedule/) each Monday for up-to-date weekly schedule and assignment due dates. Major assignment due dates are listed below after the assignment description.

**Required Textbooks and materials:**

Website: [bio2355.biosci.gatech.edu](http://bio2355.biosci.gatech.edu/)

Text: same as for lecture; textbook is a useful reference

Lab Manual: There is no lab manual for purchase for this course. Instead handouts will be provided in lab.

Notebook: You will need paper and pencil to take notes during lab. After lab, you’ll use your notes to create an electronic lab notebook entry on the course website [bio2355.biosci.gatech.edu](file:///D:\Dropbox%20(GaTech)\SoB%20curricular%20stuff\School%20of%20Biol%20Sci%20Undergrad%20Curriculum%20Committee\2018-19\BIOS%20subject%20code%20proposal\BIOS%20NCPs%20and%20syllabi\bio2355.biosci.gatech.edu).

Safety: Lab coat (see ‘Lab Safety’ below for details)

Other: Close-toed shoes and long pants are **required** for every lab held in CE123 (wet labs); calculators and laptops (one per group) are useful.

**Lab Safety**: Georgia Tech has a strict and strictly enforced 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** and may not return without appropriate clothing:

1. **Long pants** must be worn in the laboratory.
2. **Close-toed shoes** that cover the sides and top of the foot must be worn in the laboratory.
3. **Lab coats** must be worn when working at the bench. Students are responsible for keeping their lab coats in good condition and reasonably clean so as not to create a hazard. Lab coats must be 100% cotton and cover the wearer to the knees.
4. **Safety glasses** must be worn 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. Safety glasses will be made available for your use in the lab.

The laboratory safety policies (see last page of the syllabus) will be discussed in detail on the first day of lab.

**Evaluation:**

Grades will be calculated on the following scale:

A: ≥ 90.0%

B: ≥ 80.0% and < 90.0%

C: ≥ 70.0% and < 80.0%

D: ≥ 60.0% and < 70.0%

F: < 60.0%

Points will be based on the following:

Participation 10%

Pre-Lab Assessments 10%

Lab Notebooks 20%

Lab Write-ups 40%

Technique Videos 10%

Grant Proposal 10%

**Attendance:** 100% attendance is expected for each lab, and for the entire lab period. Given that you are working with others to perform experiments and collect data on an on-going project, there is no mechanism to “make-up” a lab. If you must miss a laboratory, notify the instructor by email (or phone) as soon as possible, preferably before the missed lab. There will be no make-up laboratories. Vacation, work commitments, and social events are not acceptable reasons to miss lab. Examples of legitimate reasons to miss a lab include serious illness, illness or death in your immediate family, and participation in official university activities. You will be required to provide documentation for excused absences. Unexcused absences will result in a 10% reduction in your final course grade; you will not be permitted to make up work missed in lab. Persistent tardiness may result in loss of points from your participation grade.

**Participation:** Genetics Lab requires cooperative use of materials, awareness of lab safety protocols, preparedness before class, and effective interaction in class. Each class period, we will assess your participation in class. Student use of a cell phone for non-lab business during lab may result in 0 participation points for that lab period. If you are in a situation where you must leave your phone on, please alert the instructor ahead of time and step outside to take the call. You are encouraged to check in with the course instructors at any time during the semester to gauge your participation score to date.

**Pre-lab assessments** will be available on Canvas/Quizzes on the Tuesday before each lab. Pre-labs concentrate on the upcoming lab material and are due by 11:55 pm on the Wednesday before each lab. Late submissions will not be accepted. If you miss a pre-lab due to an unexcused absence from lab, you will receive a zero for that pre-lab. You should plan to complete the assigned reading before attempting the pre-lab. Pre-labs are open-book but individual, non-collaborative assignments.

**Lab Notebook**: Your lab notebook will be maintained electronically. For each *experiment* that we address, your notebook should include an introduction to the experiment, explanations of the methods used (detailed enough that you could repeat a year from now), reasons for conducting particular methods, results of experiments you complete, explanation of analyses, and summaries of conclusions. Your notebook should describe the beginning, middle, and end of each experiment—its rare to set-up and analyze an experiment in the same day, so experiments are likely to span multiple weeks if not the entire semester. Lab notebooks should be updated after lab each week **by Friday midnight** (25% of notebook grade) and will be monitored and commented on regularly, and graded periodically. Your final notebookwill be graded on content, accuracy, and completeness according to the rubric in the lab manual (75% of notebook grade). A thorough lab notebook will be fundamental to write accurate lab write-ups. In your notebook, **you are to write in your own words**, even if you are working with a team on the experiment. The only exceptions to this are:

* team-devised protocols,
* data, which should be proofread carefully, and
* tables and figures. These may be shared within your team but should be critically examined for accuracy.

If a teammate made a mistake that you preserve in your notebook and work, you become responsible for that error as well. Therefore, data entry and analysis are best done collaboratively, with proofreading, rather than by one member of the team. Anything you write in your lab notebook may be used word-for-word in your lab report, though the notebook is better used as draft language to be revised for the lab report. The lab notebook rubric is at the end of this syllabus.

**Lab Write-ups:** During the semester, you will generate a full laboratory report in the style of a scientific journal. This report will be written in stages; each stage will receive with peer and/or instructor feedback. All lab reports are individual assignments. While lab work is done collaboratively, every component of the lab report, except shared tables and figures (see notebooks), should be generated by the report's author. There will be many writing assignments due during the semester to encourage you to test your ideas in writing. Each will be submitted electronically to Canvas/Assignments *and in hard copy in lab*; each assignmentwill be announced the week prior and will be due by the beginning of lab. A late assignment will be reduced one letter grade (10%) for each 24-hour period that it is late.

For notebooks and reports, you may want or need to set up an appointment for interactive writing assistance from tutors in the Communication Center (communicationcenter.gatech.edu) in the CULC.

**Technique Videos:** Correct bench technique is key to success in molecular biology. This requires attention to detail, knowledge of procedure, and application of lab safety protocols. This semester you will make 5 short (40-60 second) solo videos in lab to teach proper bench or lab techniques to the viewer. Videos 1 and 5 will both be on use of a micropipette to transfer a small volume of liquid. Videos 2-4 will be assigned to cover over techniques important to completion of our project. Videos will be graded on a 10 point scale for: accuracy of content knowledge, correct demonstration of technique, and quality of image and sound. Videos should be included in your lab notebook on weeks when they are due. Video due dates are in the course schedule.

**Grant Proposal:** At the end of the semester, we’ll reflect on the work we’ve done and determine what questions the data leads us to ask. From one of those questions, you will work solo or with a team to generate a short grant proposal. If you choose to work with a team, all team members will be assigned the same grade on the proposal.

**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. While students will collaborate in performing the experiments and collecting the data, each student is expected to write his or her own notebook entries and lab write-ups. **Plagiarism** includes reprinting the words of others without both the use of quotation marks and 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 instructors for help as you work on an assignment.

**Learning Accommodations:** If needed, we will make classroom accommodations for students with disabilities. These accommodations must be arranged in advance and in accordance with the Office of Disability Services ([disabilityservices.gatech.edu](http://disabilityservices.gatech.edu)).

**BEE PROJECT F18 Schedule (Tentative)**

8/23 – WEEK 1 –  Bee Overview

8/30 –  WEEK 2 – Project Planning

9/6 –  WEEK 3 – PCR Pilot

9/13 –  WEEK 4 – PCR pilot gels

**[LECTURE EXAM]**

9/20 –  WEEK 5 –  RNA🡪cDNA pilot (2 colonies)

9/27 – WEEK 6 –  Pilot PCR for presence/absence of 6 viruses from 2 colonies

10/4 –  WEEK 7 –  Experimental Design discussion

Gels for pilot PCR

**METHODS DUE (IN LAB)**

10/11 – WEEK 8 –  RNA🡪cDNA

**[LECTURE EXAM]**

10/18 –  WEEK 9 –  PCR on Week 7 samples

10/25 – WEEK 10–  Data Interpretation and Analysis (bring laptops)

**INTRODUCTION DUE (IN LAB)**

11/1 – WEEK 11–  Data assembly

11/8 – WEEK 12–  Data Analysis

**[LECTURE EXAM]**

11/15 – WEEK 13–  Results & Discussion Workshop Session

**PROJECT LAB REPORT DUE (IN LAB)**

*11/22 – WEEK 14 – THANKSGIVING HOLIDAY*

11/29 –  WEEK 15–  Grant Proposal Working Session (required)

**GRANT PROPOSAL DUE (BY MIDNIGHT)**

? – WEEK 16 ­ Bee Party!

**LAB NOTEBOOK DUE 12/6 (BY MIDNIGHT)**