

# BIOL 4505A/6505A - Programming in Biological and Health Sciences

3 credits

MW 12:30 - 1:45 PM; Van Leer C341, August 21st - Dec 7th, 2021

## Instructor Information

<b>Instructor</b>	<b>Email</b>
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**Office Hours & Location**  
By appointment - EBB Krone 3013

**Office Hours & Location**  
Nikesh: Wed. 11am - 12pm, EBB Lobby

## General Information

### Course Goals and Learning Outcomes

Computational skills have become an essential tool for biological research. This lecture course will introduce students to the process of programming using the Python scripting language and the command line. By the end of this course, a student should be able to:

- Understand the basics of writing a Python script, including importing modules, creating functions, analyzing data, and writing out results.
- Utilize common modules useful for biological data analysis, including pandas, numpy, and pysam
- Learn how to use stackoverflow and other manual pages to find information on how to use modules and functions
- Appreciate the differences between the various datatypes used to store and access data
- Perform debugging and learn how to handle exceptions

### Prerequisites

BIOS 1107 or BIOS 1207 with minimum grade of D.

## Course Requirements & Grading

Your grade will be determined by a combination of regularly scheduled quizzes, in-class activities, online homework assignments, and in-class exams. The relative value of these assessments are:

Assignment	Date	Weight
Homeworks (6 of 7)	Throughout the semester	100%

## Extra Credit Opportunities

N/A

## Description of Graded Components

For students enrolled in both the undergraduate and graduate portion of the class

There will be 6 graded homeworks. Your lowest homework grade will be thrown out, so only 5 of the homeworks will apply towards your grade.

Your performance on these will be the entire basis of your grade. **There will be no exams.** Each homework will be worth an equal amount of points. Grading for the homework and projects will be determined by both 1) whether the correct analysis is achieved and 2) coding follows expected structure and guidelines that are provided for each assignment.

## Grading Scale

The most stringent scale used for grading will be following scale:

A	90-100%
B	80-89%
C	70-79%
D	60-69%
F	0-59%

This scale is subject to adjustment at the professor's discretion. All problems regarding grades on assignments must be handled through the regrade system.

See <http://registrar.gatech.edu/info/grading-system> for more information about the grading system at Georgia Tech.

## Course Structure

All lectures will be pre-recorded on video. Class time will be spent working on example problems and an opportunity for questions on the material, exercises, or homework.

## Course Materials

### Course Text

No required text.

### Additional Materials/Resources

In general, becoming comfortable with using StackOverflow, github issues, and Google is the best approach to learning material. There are a TON of tutorials, examples, question/answers, and bug reports out there. Become comfortable finding and using these.

### Course Website and Other Classroom Management Tools

All class material will be uploaded to the Canvas website. Prerecorded lectures will be uploaded to youtube.

## Course Expectations & Guidelines

### Academic Integrity

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. For information on Georgia Tech's Academic

Honor Code, please visit <http://www.catalog.gatech.edu/policies/honor-code/> or <http://www.catalog.gatech.edu/rules/18/>.

Any student suspected of cheating or plagiarizing 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. Please note that all quizzes must be taken in the classroom. Attempts to take the quizzes outside of the classroom, or facilitating other students taking the quizzes outside of the classroom, will be considered cheating.

### **Accommodations for Students with Disabilities**

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services at (404)894-2563 or <http://disabilityservices.gatech.edu/>, as soon as possible, to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail the instructors as soon as possible in order to set up a time to discuss your learning needs.

### **Attendance and/or Participation**

Class time will be used for lectures, quizzes, group activities, and exams. If you miss lecture, *you* are responsible for obtaining all notes, announcements, and assignments. Written confirmation of a legitimate excuse, such as a severe illness, will be required if any assessment is missed. The institute's excused absence policy will be enforced in this course (<http://www.catalog.gatech.edu/rules/4/>). *No exceptions!*

### **Collaboration & Group Work**

This class will require large amounts of in-class group work. You will be informed when it is allowable to work as a group and when it is not.

### **Extensions, Late Assignments, & Re-Scheduled/Missed Exams**

There will be no credit given for any assignments turned in after the deadline. Students that miss any assignments/exams for approved Institute activities and religious observances will be excused for any missed credit. See <http://www.catalog.gatech.edu/rules/4/> for more information.

### **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. See <http://www.catalog.gatech.edu/rules/22/> for an articulation of some basic expectation 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.

### **Student Use of Mobile Devices in the Classroom**

Lecture is a time when we all work together, so be courteous to your fellow students and do not disrupt class by entering and leaving the room, reading, talking, allowing cell phones to ring, etc. In addition, do not use your electronic devices (laptops, tablets, smartphones, etc.) for non-class use.

### **Additional Course Policies**

Regrade policy: The *only* way that changes to your grades will be considered is through the procedure below. Do not approach the professor or TAs and ask for credit for an already-graded question without a written description of the problem.

Regrades can be requested if:

- (1) there has been an error in adding together your score.
- (2) you did not receive credit for an answer as given on the key.

- (3) there is a difference between your score and that of another student who gave the same answer.
- (4) you did not receive credit for an answer that differs from that on the key but which is nevertheless correct.

In general, regrades will not be considered for issues concerning the amount of credit awarded for an answer. For example, questions such as 'Why did I receive only two points for this answer instead of three?' will not be addressed unless you find evidence of issue (3).

To have an assignment regraded, you must submit a *hard-copy, typewritten* explanation of the problem along with your original exam or quiz directly to the professor (email appeals will not be considered). For issues (1) and (2), it will generally suffice to simply describe the problem. For issue (3) you will need to submit an explanation of the problem, as well as both copies of the material. For issue (4) you must give a detailed and explicit account as to why your answer is correct. In general, this may require direct quotes from the text or precise mathematical treatments as to how your solution or model yields the correct ratios, genotypes, results, etc.

Deadlines for the submission of regrades will be one week after the grade is returned to the students. *No regrades will be considered after the deadline.* Note that if you request a regrade for a particular question, your entire exam or quiz may be regraded, which could result in a lowering of your overall score.

## Campus Resources for Students

In your time at Georgia Tech, you may find yourself in need of support. Below you will find some resources to support you both as a student and as a person.

### Academic support

- Center for Academic Success <http://success.gatech.edu>
  - 1-to-1 tutoring <http://success.gatech.edu/1-1-tutoring>
  - Peer-Led Undergraduate Study (PLUS) <http://success.gatech.edu/tutoring/plus>
  - Academic coaching <http://success.gatech.edu/coaching>
- Residence Life's Learning Assistance Program  
<https://housing.gatech.edu/learning-assistance-program>
  - Drop-in tutoring for many 1000 level courses
- OMED: Educational Services (<http://omed.gatech.edu/programs/academic-support>)
  - Group study sessions and tutoring programs
- Communication Center (<http://www.communicationcenter.gatech.edu>)
  - Individualized help with writing and multimedia projects
- Academic advisors for your major <http://advising.gatech.edu/>

### Personal Support

#### Georgia Tech Resources

- The Office of the Dean of Students: <http://studentlife.gatech.edu/content/services>; 404-894-6367; Smithgall Student Services Building 2<sup>nd</sup> floor
  - Also: [https://gatech-advocate.symplcity.com/care\\_report/index.php/pid383662?](https://gatech-advocate.symplcity.com/care_report/index.php/pid383662?)
- Counseling Center: <http://counseling.gatech.edu>; 404-894-2575; Smithgall Student Services Building 2<sup>nd</sup> floor
  - 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 404-894-2204.*
- Students' Temporary Assistance and Resources: <http://studentlife.gatech.edu/content/need-help>
  - Can assist with interview clothing, food, and housing needs.
- Stamps Health Services: <https://health.gatech.edu>; 404-894-1420
  - Primary care, pharmacy, women's health, psychiatry, immunization and allergy, health promotion, and nutrition
- Women's Resource Center: <http://www.womenscenter.gatech.edu>; 404-385-0230
- LGBTQIA Resource Center: <http://lgbtqia.gatech.edu/>; 404-385-2679
- Veteran's Resource Center: <http://veterans.gatech.edu/>; 404-385-2067
- Georgia Tech Police: 404-894-2500

## Course Schedule - *subject to change!*

Week	Date	Topic	Due
1	21-Aug	Intro and installing Python	
	23-Aug	Command line basics	
2	28-Aug	Python basics	
	30-Aug	Strings/Lists	
3	4-Sep	No class - Labor Day	HW 1 due
	6-Sep	Scripts/Functions	
4	11-Sep	Conditionals/Loops	
	13-Sep	Dictionaries/Modules	
5	18-Sep	Research Example 1	HW 2 due
	20-Sep	Research Example 1 Cont.	
6	25-Sep	Reading/writing data 1	
	27-Sep	Reading/writing data 2	
7	2-Oct	Pandas 1	
	4-Oct	Pandas 2	
8	9-Oct	No class - Fall Break	
	11-Oct	Guest Lecture: Tucker J. Lancaster	
9	16-Oct	Pandas 3	HW 3 due
	18-Oct	Pandas 4 (catch up day for exercises & hw)	
10	23-Oct	Numpy 1	
	25-Oct	Numpy 2	
11	30-Oct	Visualization 1	HW 4 due
	1-Nov	Visualization 2	
12	6-Nov	Command Line I	
	8-Nov	Command Line II	
13	13-Nov	Error/Debugging	HW 5 due
	15-Nov	Structure Analysis 1	
14	20-Nov	Structure Analysis 2	
	22-Nov	No class - Thanksgiving	
15	27-Nov	Structure Analysis 3	HW 6 due
	29-Nov	Machine Learning 1	
16	4-Dec	Machine Learning 2	
	6-Dec	No class - Reading Day	