BIOL4505A Syllabus

Programming in Biological and Health Sciences

Fall 2026

Instructor Information

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General Course Information

Description

Computational skills have become an essential tool for biological research. This course will introduce students to the process of programming using the Python scripting language and the command line. Students will learn these skills through a combination of lectures, daily activities, and projects – all which focus on biological applications.

Course Learning Outcomes

- 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

Required Course Materials

There are no required textbooks for this course. Daily lectures will be available through the Canvas website. In general, becoming comfortable with using StackOverflow, github issues, and Google is the best approach to learning material. There are MANY tutorials, examples, question/answers, and bug reports out there. This class will help you become comfortable finding and using these.

Grading Policy:

Your grade will be determined by a combination of regularly scheduled in-class activities and three projects. The relative value of these assessments are:

Assignment	Date	Weight
Projects (3 total)	Throughout the semester	30%
Exercises (weekly)	Throughout the semester	70%

Grading will be the following scale:

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

Description of Graded Components

For most classes, there will be an activity that tests your understanding of the material covered in class. These are to be completed in class but you can finish outside of class if necessary. Each will be composed of ~10 short exercises that you should be able to complete in 1-5 line of code. These are the building blocks that will prepare you for the longer projects.

There will be 3 graded projects. These are longer assignments that will typically require multiple weeks of effort to complete, each utilizing skills from ~1/4 to 1/3 of the class.

Your performance on these will be the entire basis of your grade. **There will be no exams.** Each homework will be worth an equal number 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.

Course Policies

Attendance and/or Participation

Class time will be used for lectures, group activities, and time for projects. 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. Students can turn in in class activities if they miss class up to three times. After that they will receive a zero for the activity that they missed.

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. 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.

Core IMPACTS

Core IMPACTS is the University System of Georgia's General Education curriculum. If you are teaching a course that counts towards Core IMPACTS, you should include a syllabus statement about the Core area and associated career competencies. This resource developed by the Center for Excellence in Teaching and Learning and Online Education at Georgia State University includes template syllabus statements for each of the Core IMPACTS areas that you may adapt for your course.

Accommodations for Students with Disabilities

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

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.

Pre- &/or Co-Requisites

BIOS 1107 or BIOS 1207 with minimum grade of D.

Extra Credit Opportunities

None

Collaboration, Group Work, and Use of Generative AI

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. Read more about approved exceptions. Additional exceptions will be granted at the discretion of the instructor provided the student provides advance notice.

Campus Resources for Students

Undergraduate Student Academic Success Resources:

- Academic Support: Academic Success and Advising (a unit in the Office of Undergraduate Education & Student Success) provides free support for your courses. Students can attend scheduled supplemental review (PLUS) sessions, stop by Drop-In Tutoring, or schedule a one-on-one appointment through Knack. To explore what options work best for you, please visit us online at success.gatech.edu/tutoring, email us at tutoring@gatech.edu, or come see us at Clough Undergraduate Learning Commons, Suite 283.

Graduate Student Academic and Professional Success Resources:

A list of resources for graduate students is given on the Office of Graduate and Postdoctoral Education website. Specific information for current graduate students includes

- Academic Resources such as the Communications Center, Language Institute, Library, Catalog, Registrar, resources for conducting research, Advocacy and Conflict Resolution resources, and how to manage unexpected situations that may impact your academic performance;

- Student Resources such as Campus Services, Child Care/Family programs, Health & Wellness, Career Services, and the Student Resource Guide; and
- *Professional Development such as the programming from the Career Center and other professional development resources and events"*

Student Well-Being:

At Georgia Tech, we are concerned about your overall physical, social, and mental well-being. A comprehensive list of wellness related resources has been compiled and maintained by the Office of the Vice President for Student Engagement and Well-being (student-resource-guide (gatech.edu)

Example Course Schedule

Week	Date	Topic	Due
1	18-Aug	L1 - Intro and installing Python	
	20-Aug	L2 - Command line and file systems	
2	25-Aug	L3 - Python basics	
	27-Aug	L4 - My First Script - Input/output/debugging	
3	1-Sep	No class – Labor Day	
	3-Sep	L4 – My First Script - Continued	
4	8-Sep	Cancelled	
	10-Sep	L5 - Containers (exercises?)	
5	15-Sep	L6 - Functions	
	17-Sep	L7 – Bacterial Killing I	
6	22-Sep	L7 – Bacterial Killing II	
	24-Sep	L8 – Analyzing Tabular Data I	
7	29-Sep	L9 – Analyzing Tabular Data II	**Project 1 Due -> Expasy**
	1-Oct	L10 – Analyzing Tabular Data III (read_html exercis)	
8	6-Oct	No class - Fall Break	
	8-Oct	L11 – Analyzing Tabular Data IV (IFR exercise)	
9	13-Oct	L12 - Genomics (read in genome identify enzymes)	
	15-Oct	L13 - Genomics (read in vcf file identify something)	
10	20-Oct	L14 - Numpy I (read in depth data basics)	
	22-Oct	L15 - Numpy II (reimplement bacterial killing)	
11	27-Oct	L16 - Numpy III (interpolation)	
	29-Oct	L17 - Pedigree example (pedigree)	**Project 2 due -> Rad**
12	3-Nov	L17 - Pedigree example (pedigree)	
	5-Nov	L18 - Visualization – Matplotlib (create subplots)	

Week	Date	Topic	Due
13	10-Nov	L19 - Visualization – Seaborn (graph with hue; heatmaps)	
	12-Nov	L20 - Command line (Basics)	
14	17-Nov	L21 - Command line (primer3)	
	19-Nov	L22 - Cloud Basics (basics of rclone; create remote; list remote directory, copy back and forth)	
15	24-Nov	L23 - Classes (DNA object)	
	26-Nov	No class - Thanksgiving	
16	1-Dec	L24 - Classes (File Manager object)	**Project 3 due -> PCR**
	3-Dec	No class – Reading Day	