Columbian College
of Arts & Sciences
THE GEORGE WASHINGTON UNIVERSITY

Department of Biological Sciences

BISC 4171

Undergraduate Research

Syllabus

Spring, 2026

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Student Hours: Wed/Fri 1-2pm or by appointment
Credit Hours: 1

Course Description

This is a 1-credit undergraduate research course. Students will conduct an independent, guided bioinformatics research project with a neural focus. Students will download a public gene-expression count table and build a small Python pipeline to perform quality checks, rank genes by differences between groups, and interpret findings in the context of brain biology.

Course Prerequisites

Academic Prerequisites

Prerequisites: none

Minimum Technology Requirements and Skills

Configuration and software

During the course, you will need regular access to broadband Internet access, a reliable desktop or laptop computer, software such as Microsoft Office and Zoom, as well as other technology components. Ability to install software (Miniconda recommended) and run Python scripts from a terminal. Navigate to GW Information Technology and choose "Students" to get the tools and support you need to access and fully participate in our course.

Minimum technology skills

For our course, you should be able to:
- Access and use GW's Blackboard system.
- Use your GW email for university-related communications per university policy.
- Use productivity software (e.g., Office 365, Google Suite) to collaborate with peers and submit assignments.

- Use web conferencing tools (e.g., Zoom, Webex) to collaborate with peers and me. You will need a working webcam and microphone.
- Use a mobile device and/or computer to upload documents, media, and other course files.
- Be willing and able to seek technology help and tools by contacting GW Information Technology | (202)-994-4948 | ithelp@gwu.edu.
- Ability to install software (Miniconda recommended) and run Python scripts from a terminal.

If you need assistance with technology tools we'll use in this course, please visit the **Technology Support** section of our course in Blackboard. Contact GW Information Technology | (202)-994-4948 | ithelp@gwu.edu for all Blackboard and technology support.

Learning Objectives and Outcomes

Course and module learning objectives are guides to gauge your skill and knowledge development.

As a result of completing this course, you will be able to:

1) Set up a reproducible Python environment for data analysis (pandas, numpy, matplotlib).
2) Explain what a gene count matrix is and how metadata defines experimental groups.
3) Perform basic QC checks and visualization for gene-count data.
4) Compute and interpret simple gene-ranking results for two required comparisons: (1) WT SD5 vs WT HC5 and (2) Shank3 vs WT (matched condition).
5) Communicate results clearly in a midterm progress report, final report, and lightning talk slide.
6) Use AI tools responsibly for code debugging when helpful (optional), and be able to explain your final code and results in your own words.

Direct Instruction and Indirect (Independent) Learning | Course Credit Hour Policy

This course is designed for consistent progress across the semester. Students should expect approximately 4 hours per week of independent work on average. Work will vary by week depending on your progress and debugging needs. Note that you may do far more than this, or somewhat less than this, based on what we're working on during a particular week, as well as your personal work pace.

Required Textbook and Other Materials You'll Need

1) Course materials, project packet, and starter scripts are provided via the course GitHub repository (download as ZIP; no Git required) and Blackboard.
2) Software: Python 3.11+, pandas, numpy, matplotlib, scipy, statsmodels.
3) Public dataset: NCBI GEO GSE113754 (processed counts tables).

Methods of Instruction and Assessment

Instruction

Asynchronous/independent research. There is no scheduled meeting time. Students complete work independently and communicate with the instructor by email and/or appointment as needed.

Assessment and Grading

I've designed the following activities and assignments to help you gauge and demonstrate your progress in the course and support you in meeting our learning objectives.

1) **Midterm Progress Report** (Aim 1: WT SD5 vs WT HC5): 35%
2) **Final Report** (Aim 1 + Aim 2 genotype required): 45%
3) **Lightning talk** (one-slide PDF + 2-3 min recording): 10%
4) **Code + reproducibility package**: 10%

You'll find support for Blackboard and other tools used for learning activities and assessments in the **Technology Support** section of our course on Blackboard.

The grading scale below maps your final point or percentage total to your final letter grade for the course.

- 94 to 100 = A
- 90 up to less than 94 = A-
- 87 up to less than 90 = B+
- 83 up to less than 87 = B
- 80 up to less than 83 = B-
- 77 up to less than 80 = C+

- 73 up to less than 77 = C
- 70 up to less than 73 = C-
- 67 up to less than 70 = D+
- 63 up to less than 67 = D
- 60 up to less than 63 = D-
- less than 60 = F

Late Work

I expect work to be submitted on time. **No late work will be accepted.** If you cannot meet the deadline for an assignment, please join me on Zoom *prior* to the due date to talk about any issues surrounding late submission of work.

Course Communication

Communication in our course is essential; clearing up questions earlier than later is a good practice, so please don't hesitate to reach out to me. In any mode of communication used in our course, all of us will follow the netiquette guidelines in our syllabus.

We will communicate primarily via student hours, appointments, but also through GW's Blackboard System and email. Announcements and emails sent through Blackboard automatically go to your GW

email address (i.e., userid@gwu.edu). Please check your GW email account on a daily basis or forward your GW email to another address that you check daily.

Using outside communication apps

I am aware that you and your peers might communicate using tools outside of GW's Blackboard or email systems. Rules of netiquette and appropriate communication extend to these tools as well as to Blackboard. If you see any tool being used inappropriately (i.e., any communication containing language that is offensive, rude, profane, racist, or hateful; uses that promote cheating of any kind), contact me as soon as possible to speak privately about it. *(Adapted from Lake Superior Connect, Creative Commons Attribution 3.0)*

University Policies

To make this a meaningful learning experience for everyone, please read and understand the following policies. All GW policies can be found on the GW Office of Ethics, Compliance, and Privacy site. All GW community members are responsible for adhering to and activating in accordance with all university policies. Please contact me if you have any questions.

Academic Integrity Code

Academic integrity is an essential part of the educational process, and all members of the GW community take these matters very seriously. As the instructor of record for this course, my role is to provide clear expectations and uphold them in all assessments. Violations of academic integrity occur when students fail to cite research sources properly, engage in unauthorized collaboration, falsify data, and otherwise violate the Code of Academic Integrity. If you have any questions about whether particular academic practices or resources are permitted, you should ask me for clarification. If you are reported for an academic integrity violation, you should contact Conflict Education and Student Accountability (CESA) to learn more about your rights and options in the process. Consequences can range from failure of assignment to expulsion from the University and may include a transcript notation. For more information, refer to the CESA website or contact CESA by email cesa@gwu.edu or phone 202-994-6757.

Learn more about maintaining academic integrity

Maintaining academic honesty can be a challenging skill to learn. If you have questions about maintaining our course standards, please talk with me early on. I also recommend the following resources:

- GW guidance for students on academic integrity.
- "Plagiarism: What is it and how to avoid it" from GW Libraries.

Generative Artificial Intelligence In Our Course

Generative AI tools are permitted in a limited way: students may use AI to debug code (e.g., interpret error messages, suggest fixes, or refactor code for clarity). There is no AI log requirement. However, you must (1) be able to explain your final code and analysis in your own words and (2) include a brief disclosure in your report (1-2 sentences) describing any AI assistance you used and for what purpose. Using AI to generate large portions of your written reports without attribution, to fabricate results, or to submit work you do not understand is not permitted and may be treated as an academic integrity violation.

University Policy on Religious Observances

Students must notify faculty during the first week of the semester in which they are enrolled in the course, or as early as possible, but no later than three weeks prior to the absence, of their intention to be absent from class on their day(s) of religious observance. If the holiday falls within the first three weeks of class, the student must inform faculty in the first week of the semester. For details and policy, see the [Office of the Provost Policies, Procedures, and Guidelines website](#).

Use of Electronic Course Materials and Class Recordings

Students are encouraged to use electronic course materials, including recorded class sessions, for private personal use in connection with their academic program of study. Electronic course materials and recorded class sessions should not be shared or used for non-course related purposes unless express permission has been granted by the instructor. Students who impermissibly share any electronic course materials are subject to discipline under the [Student Code of Conduct](#). Please contact the instructor if you have questions regarding what constitutes permissible or impermissible use of electronic course materials and/or recorded class sessions. Please contact [Disability Support Services](#) if you have questions or need assistance in accessing electronic course materials.

Academic Support

Academic Commons

[Academic Commons](#) is the central location for academic support resources for GW students. To schedule a peer tutoring session for a variety of courses visit [Academic Commons Peer Tutoring](#). Visit [Academic Commons](#) for study skills tips, finding help with research, and connecting with other campus resources. For questions email [academiccommons@gwu.edu](#).

Writing Center

[GW Writing Center](#) cultivates confident writers in the University community by facilitating collaborative, critical, and inclusive conversations at all stages of the writing process. Working

alongside peer mentors, writers develop strategies to write independently in academic and public settings. Appointments can be booked online at the [GW Writing Center website](#).

Support For Students In and Outside the Classroom

Disability Support Services (DSS) 202-994-8250

Any student who may need an accommodation based on the potential impact of a disability should contact [Disability Support Services](#) to establish eligibility and to coordinate reasonable accommodations.

You can learn more about [GW's Disability Policy](#) online.

Learn more about how course technology is accessible to everyone. Go to your **Blackboard course site | Technology Support | Technology Tools Policies** section.

Student Health Center 202-994-5300, 24/7

[The Student Health Center (SHC)](#) offers [medical,](#) [counseling/psychological,](#) and [psychiatric](#) services to GW students. More information about the SHC can be found on [the SHC website.](#) Students experiencing a medical or mental health emergency on campus should contact GW Emergency Services at 202-994-6111, or off campus at 911.

Additional resources

- [Student Services](#)
- [Getting Your GWorld Card](#)
- [Student Affairs | Community Resources](#)

GW Campus Emergency Information

GW Emergency Services: 202-994-6111

For situation-specific instructions, refer to [GW's Emergency Procedures guide.](#)

GW Alert

[GW Alert](#) is an emergency notification system that sends alerts to the GW community. GW requests students, faculty, and staff maintain current contact information by logging on to the [GW Alert site.](#) Alerts are sent via email, text, social media, and other means, including the Guardian app. The Guardian app is a safety app that allows you to communicate quickly with GW Emergency Services, 911, and other resources. Learn more at [GW Safety.](#)

Protective Actions

GW prescribes four protective actions that can be issued by university officials depending on the type of emergency. All GW community members are expected to follow directions according to the specified protective action. The protective actions are Shelter, Evacuate, Secure, and Lockdown (details below). Learn more at [GW Safety's Emergency Statuses site](#).

Shelter
- Protection from a specific hazard
- The hazard could be a tornado, earthquake, hazardous material spill, or other environmental emergency.
- Specific safety guidance will be shared on a case-by-case basis.
  ### Action:
    - Follow safety guidance for the hazard.

Evacuate
- Need to move people from one location to another.
- Students and staff should be prepared to follow specific instructions given by first responders and University officials.
  ### Action:
    - Evacuate to a designated location.
    - Leave belongings behind.
    - Follow additional instructions from first responders.

Secure
- Threat or hazard **outside** of buildings or around campus.
- Increased security, secured building perimeter, increased situational awareness, and restricted access to entry doors.
  ### Action:
    - Go inside and stay inside.
    - Activities inside may continue.

Lockdown
- Threat or hazard with the potential to impact individuals inside buildings.
- Room-based protocol that requires locking interior doors, turning off lights, and staying out of sight of corridor windows.
  ### Action:
    - Locks, lights, out of sight
    - Consider Run, Hide, Fight

Classroom emergency lockdown buttons:
All classrooms have been equipped with classroom emergency lockdown buttons. If the button is pushed, GWorld Card access to the room will be disabled, and GW Dispatch will be

alerted. The door must be manually closed if it is not closed when the button is pushed. Anyone in the classroom will be able to exit, but no one will be able to get in.

Course Calendar

Activities and assessments are due by noon Eastern Time (ET - local time in Washington, DC) on the days indicated on Blackboard unless otherwise noted. Links to course learning materials and for submitting your work are also located in our Blackboard course site. *This calendar is subject to change based on course progress. I will notify you of any changes.* ==*The most updated information will always be our Blackboard course.*==

Weeks	Milestone	What to have done
1-2	**Setup**	• Download repo ZIP • Create conda environment • Create data/ and results/ folders • Run download script
3-5	**Aim 1 draft**	• Load counts • Confirm metadata • QC plot • Preliminary volcano plot • Top genes list
6-7	**Midterm**	• Clean Aim 1 figures • Short interpretation • Submit midterm progress report
8-10	**Aim 2**	• WT vs Shank3 within HC5 • Finalize tables/figures
11-13	**Final package**	• Integrate Aims 1 + 2 • Finalize reproducibility zip • Lightning talk slide • Submit final report