Bio131: Introduction to Computational Biology

High-throughput technologies produce massive amounts of data, much too large to analyze by hand. The goal of this course is to learn how to analyze DNA, RNA, and protein sequences using computers. Through a combination of foundational examples and current research questions, this course aims to demystify computer science, molecular biology, and some of the ways they intersect.

Who this class is for

This class is for anyone who wants to learn about biological questions that can be addressed with computation and gain insight into how these computational problems are solved. This class is also for students who want to explore how biological advances might affect or reflect societal values. Bio131 is an introductory course, assumes at least one semester of Topics in Biology (Bio101/102) concepts, and has no prerequisite programming knowledge. Students from all years and many different majors come together in this class to collectively learn about computational biology.

About this syllabus

This syllabus is a public, searchable document that contains all of the details for this iteration of the course. It serves as a contract for the students taking Bio131 - if you take this course, you agree to abide by the policies described here. As the instructor, I commit to following this syllabus and administering it fairly and equitably. The main parts of the syllabus are:

- Goals: the course goals and learning objectives.
- Support: the support systems offered in the course.
- Policies: policies surrounding attendance, deadlines, collaboration, and generative AI (e.g., ChatGPT).
- Schedule: an overview of the course topics and assignemnts.
- Assessment: a detailed explanation of the contract grading in the course.
- Learning Environment: my commitment to making the classroom an inclusive learning environment.
- Land Acknowledgement: an acknowledgement that Reed College rests on territory belonging to Indigenous peoples.
- Keys for Success: tips for succeeding in the course.

The final version of this syllabus will be set by Monday, January 22. Any modifications during the semester will be noted in the change log and will be communicated to the class via Moodle. We will discuss any major changes to the assessment and grading contract in class before the syllabus is altered.

Course details

Instructor: Anna Ritz (Biology 200B, see the support page for student hours)

Lecture: MWF 10-10:50am in Chem 301

Labs: M 1:10-3:00 in ETC 211 and Tu 3:10-5:00 in ETC 208.

Materials:

- Textbook: Bioinformatics Algorithms by Pavel Pevzner and Philip Compeau. The chapters we will cover in class are freely available online. The textbook is also available at the library and in the bookstore.
- Book: you will choose between one of these two books within the first two weeks of class (both are available at the bookstore):
  - The Social Life of DNA: Race, Reparations, and Reconciliation After the Genome by Alondra Nelson
  - Native American DNA: Tribal Belonging and the False Promise of Genetic Science by Kim TallBear

Communication & Technology

Official communications about all course materials and assignments will be done through the Moodle page.

- Check your email every day to stay updated.
- We will use GitHub and GitHub Codespaces for the programming assignments (you will be taught how to use it).
- We will use Moodle for some assignments (e.g., the starter assignment and the book reflections).
- If you have a question, others likely have the same question. Reach out at any time to me at aritz@reed.edu.

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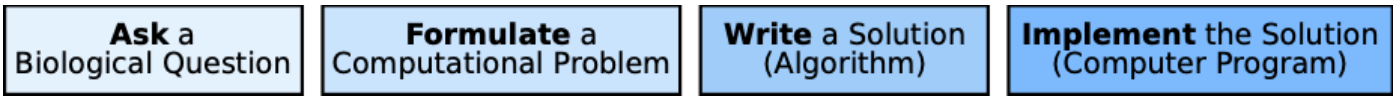
Goals & Objectives

In Bio131, you will become familiar with how cells use molecules to transfer and process information, what types of biological questions about molecules can be investigated using computers, and what limitations computational methods impose on the understanding of biology. Additionally, you will learn about one application of sequence analysis (determining genetic relatedness) and how it has influenced society and culture.

Specifically, by the end of this course:

- You will know about the properties of DNA, RNA, and proteins, the relationships among these molecules, and some **biological questions** that have puzzled researchers.
- You will know how to convert a biological question into a **computational problem** that can be solved using computers.
- You will know how to read and understand solutions to computational problems, which will be formalized as a series of tasks (an **algorithm**). You will learn about general approaches for solving computational problems, and you will be able to apply these approaches to new problems you encounter.
- You will know how to implement the algorithms by writing **computer programs** in Python, which can be run and understood by others.
- You will learn about how genetic testing has influenced society and culture.



Bio131 satisfies the Group III distribution requirements, and you can find the relevant group distribution learning outcomes in the course catalog description. Note that Bio131 does **not** satisfy Group III's "Data Collection and Analysis" requirement.

Bio131 is designed for you to pursue your own interests within the scope of these learning objectives. We will use contract grading, which aims to reduce student competition, encourage risk-taking, and support intrinsic motivation. More information about this grading assessment is provided on the assessment page.

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Course support

Bio131 has a number of support systems to help you in this class.

Student Hours: Tu 10-11 & Th 3-5, Biology 200B

Student hours are times where I am in my office (Biology 200B) waiting for students to come talk with me. Drop in during these times to talk about anything (class related or otherwise), no appointment needed. Email me to set up an appointment if you cannot make student hour times.

If many students cannot make these posted times, I may shift my student hours.

Teaching Assistant (TA)

Altaf Barelvi (he/him, Lewis & Clark '23) is a post-baccalaureate researcher here at Reed. Altaf will be in the lab sections to will help you with the labs and any other in-lab work. He will not grade or do other course tasks – Altaf's only goal is to help you with your work.

Tutoring (DoJo)

Tutoring is offered by Accademic Support Services, and gives students additional times outside of class to get help with assignments and the course material. Each student can get up to one hour per week *per class* of individual (one-on-one) tutoring. *I am currently working to find tutors who will be available for one-on-one tutoring.* Once we have tutors in place, you can sign up for individual tutoring on the Reed tutoring app.

Community Sessions

If students are interested, I will reserve a room in the Biology building for evening collaborative sessions to work on the assignments together. These sessions are in lieu of drop-in tutoring this year - I encourage you to do the work together because you can help each other out (especially if you get stuck) and programming together can be fun.

Academic Accommodations

Please discuss any documented accommodations with me. Disability Accommodation Notification Letters can be obtained from Disability & Accessibility Resources. All discussions will remain confidential.

Illness and Exceptional Circumstances

There may be cases where you cannot attend class for stretches at a time (due to illness, for example). In this case, email me to strategize a successful plan for learning the material. If you miss multiple classes and do not email me, I may reach out to make sure you are OK.

In rare cases, there may be circumstances beyond your control where you are unable to meet the expectations outlined in this syllabus. If there are extenuating circumstances that might impact your academic performance in this class, please inform me as soon as you can to strategize a plan for completing all parts of the course. Additionally, you may want to reach out to the Student Life Office at student-life@reed.edu, phone: (503) 517-7396, office: Eliot 218. The Student Life Office is dedicated to assisting students in accessing campus and support resources, especially during challenging situations.

Obligated Reporting

I am happy to talk with you about anything that concerns you, but note that I (and many faculty) are obligated reporters who must report possible violations of the Title IX and DHSM policies which govern discrimination and harassment on the basis of sex, gender, and gender identity. Confidential resources are available at Health & Counseling Services and through the SHARE program; more information is available on this page.

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Course Policies

There are four policies for this course: one for attendance, one for deadlines, one for collaboration (which is encouraged for the programming assignments) and one for the use of generative AI (which is discouraged).

Attendance Policy

The purpose of the in-class components is to learn the material in the lecture time (through a combination of lectures and activities) and to get a chance to implement core programming concepts in the lab time (with the support of myself, the TA, and other students). All lecture and lab materials will be posted to the Moodle before (or, in the case of slides, shortly after) the lecture or lab. Listening to the delivery of the materials and working through the activities with other students will help you learn the content of the course much faster.

- You should attend and fully participate in the scheduled lectures.
- You should attend and fully participate in the two scheduled book discussions during the scheduled lab section.
- You should have two one-on-one meetings with me during the scheduled lab section.
- You should complete the scheduled labs, and I strongly encourage you to attend the labs to complete them during your lab section. If you decide to complete them on your own, you must talk with me about your plan first.

There is no penalty for missing in-class components, but you should email me if something is preventing you from attending more than one class/lab. Please see "Illness and Exceptional Circumstances" on the support page. If you miss multiple classes, I may reach out to make sure you are OK. Communication is key.

The Main Takeaway: There is no penalty for missing class, but attending and participating is expected and will set you up for success.

Deadline Policy

The eight common assignments (which are outlined on the types of work page) all have deadlines. Refer to the Moodle page for a detailed schedule with deadlines. As described in the Faculty Code, no work for spring courses may be accepted after the last day of final exams for spring semester.

The purpose of these deadlines is for you to complete the assignments at a steady pace in the first 11 weeks of the semester as you learn the biology, programming, and societal aspects of the course. The lectures and activites are carefully designed so the common assignments require the skills and knowledge that you learn in the lectures. **You should submit your assignments by the posted deadlines.** You have an opportunity to revise *all* of the common assignments, so you should submit what you have by the deadline, even if it is incomplete. My feedback will help you in your revision of the work.

The last two weeks of the semester are designated for choose-your-own (CYO) assignments. However, you may decide to use this time to complete any common assignments that are missing or partially completed. Refer to the grading contract for more information.

Please note, though, that if you routinely submit partial work by the deadline you will end up having to complete those past-due assignments at the same time as you complete the upcoming assignments. This might be very challenging, especially if you are working on multiple programming assignments at the same time. The last two weeks are *not* enough time to complete all of the common assignments. If you are feeling overwhelmed, come talk to me to strategize a plan for successfully completing the common assignments.

The Main Takeaway: Assignment deadlines are intentional, and you should submit your work by the deadline. You will be able to resubmit any of the work, but the class is not designed so you can submit *all* the work at the very end of the semester.

Also, all work must be submitted by the last day of finals: Thursday, May 9th at 5pm

Collaboration Policy

Computational biology is inherently a collaborative field, and there are many opportunities to work with and get help from different people within and outside of class. As an interdisciplinary course, doing work in Bio131 may lead to a few questions. Who can you talk to? What resources can you use? What does it mean to "cheat" while writing a program? This section describes available resources and what actions are in violation of the Honor Principle.

1. You can ask **anyone** (Anna, TAs, other students) **anything** during lectures and labs.
2. You can **always** come to posted student hours or email Anna to meet outside of those hours.
3. You can **always** look up how to use specific data types, syntax, and built-in functions we have learned in Python.

Exams will have an in-class, collaborative component and a take-home, individual component. You can work with other students on the

in-class component, but you should do the take-home component on your own. Follow the instructions provided with the exam about what resources you can use during the exam.

Working together is encouraged for the **programming assignments.** You can talk to other students about the homework as much as you like, but you must write your own programs (even if you do it side-by-side). You need to "cite" who you work with - see below for more information.

You are encouraged to talk with others about the **book assignments**; the reflections should be your own writing.

Plagiarism when programming

Code plagiarism is a real thing. Just like when writing papers, there is a way to cite others' work. Identical code is just as bad as copying and pasting entire paragraphs of an essay from another source - **always write your code in your own style.** You have a lot of flexibility in naming variables, including print statements and comments in your code.

1. The early programming assignments may have instructions to copy code exactly; in these examples, many students will have identical code, which is fine. If you are uncertain about an assignment, ask me.
2. Your code may look similar to others if you work side by side. If you have extensive discussions with me, TAs, or students, add their names as comments to the top of the file. For example,

```
# Anna helped me begin problem 2
# I discussed how to speed up problem 4 with Alex
# I helped Jane out with problem 5.
```

Remember, this type of collaboration is expected and encouraged! People who worked together should list each other as collaborators, since this will help us determine why some code might look similar.

The Main Takeaway: Collaboration in class and on programming assignments is expected and encouraged! You should "cite" anyone you worked with on the programming assignments.

Generative AI Policy

Generative AI is technology that is trained to generate text, images, or code from natural language prompts. Two examples of generative AI that you might have seen before are ChatGPT (which returns text based on prompts) and GitHub Copilot (which returns code based on prompts).

The fact is, generative AI could do a pretty darn good job with some of the **programming assignments**. But the assignments are designed for *you* to learn how to program in Python, and how to apply those skills to biological questions. Some of the things that are easy for generative AI to do – for example, write some starter code for an assignment – are extremely useful exercises for people who are learning to program. The course goals of this class include learning how to implement computational biology solutions - if you use generative AI to do that, you are not demonstrating that you can do this on your own.

The same goes for using generative AI for solving **exam questions**. Generative AI might get some questions correct, but *you* would not be demonstrating that you have learned the content. Don't worry - you will have opportunities to revise exams in order to demonstrate your learning.

Finally, generative AI will not do much good **writing reflections** based on the books, since the goal of the reflections is not necessarily the quality of the writing but a preparation for the in-lab discussion with your colleagues.

The goal of this class is to never make you feel like you just have to get the answer, no matter where it comes from. If you are feeling like this, then come talk with me and/or the tutors and we will strategize a way to help you learn the content without that pressure.

The Main Takeaway: Generative AI should not be used in this class. But you should never feel the need to use it anyway.

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Schedule Overview

There are eight common assignments, eight programming labs, two book reflections & discussions, and two conferences (one-on-one meetings) that are scheduled in Bio131. See the course assessment page for more details about these types of work.

This schedule may shift and the assignment timelines are approximate; refer to the Moodle page for up-to-date information and a full schedule.

	Lecture	Lab	Assignment
Week 1	Intro to Intro	L1: Python Setup	Grade Contract
Week 2	DNA, RNA, & Transcription	L2: Pattern Maker	P1: Python Practice
Week 3	Protein & Translation	L3: Reverse Complement	B1: Reflection 1
Week 4	Replication	Book Discussion	P2: Central Dogma
Week 5	Motifs	L4: Prog. Potpourri	
Week 6	Motif Finding	L5: Pattern Counter	E1: Exam 1
Week 7	Wrap up Motifs	Conferences	P3: Motif Finding
	Spring Break		
Week 8	Sequence Alignment	L6: Drawing Graphs	B2: Reflection 2
Week 9	Sequence Alignment II	Book Discussion	B4: Alignment
Week 10	Genome Assembly	L7: Pattern Maker II	
Week 11	Wrap up Assembly	L8: While Loops	E2: Exam 2
Week 12	Genome Rearrangements	Conferences	
Week 13	Sequencing Peptides		
	Reading Period		
	Finals Period	Monday, May 6th from 1-4pm	Optional Presentations

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Course Assessment

Bio131 is based on *labor based grading*, which has been extensively described and used by Asao B. Inoue at Arizona State University. For more information about labor based grading for writing classes, refer to his "Where Does Grading Come From?" blogpost series. In the Spring 2024 iteration of Bio131, we are going to use aspects of labor based grading and contract negotiations (adapted from Asao B. Inoue's 2023 template). The purpose of this structure and the grading scheme is to give students a chance to explore the biology, computational methods, and how these ideas might affect or reflect societal values.

Keep in Mind: Since this is the first time we're doing labor based contract grading in Bio131, there might be some bumps in the road. Please be flexible and communicate any issues you see as we go.

Purpose

Grades have been purported to be an unbiased way to evaluate students in a course - faculty use them to motivate student learning, compare student performance, and gain an overall assessment of student learning. In fact, many studies have found that grades have the exact opposite effect - they can lessen a student's motivation to learn, they can create a competitive classroom environment, and they have been shown to be inconsistent (Schinske and Tanner 2017). Additionally, grades have an underlying assumption that every student is the same – in their preparation, in their learning styles, and in their reasons for taking the class (Robinson 2020 TED Talk). In short, grades do not help students learn and grades do not value the differences that students bring to the classroom.

For the time being, though, we're stuck with grades. While Reed's policy of an "S" denotes satisfactory work, you all earn a grade in each one of your classes (whether you see it or not). Labor based contract grading aims to reward the process and practice of learning, encourage risk-taking, and give students agency to learn concepts that they are the most interested in. The goal is to shift the power of the grade from the instructor (with the instructor's values) to the students.

In contract grading, students have agency in choosing what success means to them. Some students, for example, might be very motivated to learn about programming skills and want to use this class as an entry point to computer science. Others might be more interested in the biological questions that have been "solved" by computational methods and in the questions that remain unanswered. Still others might be drawn to the connections to society and social science aspects of the topics. These are all good reasons for being in the class, and there is flexibility to dive into what you are most excited about.

Contract grading clearly outlines the criteria for success for each type of work in the course and how that culminates in a final grade. If you have done all that is asked of you in the criteria for success, you have completed the work. I will be giving you lots of feedback along the way, but this feedback is designed to be decoupled from your completion of the work (with some exceptions). You will know your grade at each step of the course because you will negotiate the grade with me at the 8-week mark and at the 12-week mark. This negotiation gives you the space to explain how you have completed the learning objectives through your labor in the class.

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Types of Work

There are three types of work that will be done outside of class: work on **biology and computational thinking concepts**, work on **programming skills**, and work on **biology and society**. In addition to these three themes, there is also some in-class work that will count towards your grade. All work will be assessed as "complete," "partially complete," or "missing" according to the criteria below.

Each section also includes a number of choose-your-own (CYO) assignments. You will have time to complete one or more of the CYO assignments near the end of the semester; they are explained in more detail in the grading contract. All work for the course must be completed by the last day of finals (Thursday, May 9th) at 5pm.

1. Biology and Computational Thinking

In Bio131, you will learn about biological sequences (DNA, RNA, and protein), the relationships among these molecules, and some biological questions that researchers study. You will also learn how to take these biological questions and turn them into a form that can we can solve with computation.

The work for this theme consists of two take-home exams (E1 and E2). The purpose of the exams is to demonstrate your knowledge about the concepts from lectures, so the exams must be done individually. The exams consist of multiple questions (usually 5-7 questions). To pass a question, you will have to follow all directions and get the majority of the question correct. The criteria for success will be clearly described for each question on the exam. You will have the opportunity to revise the questions after receiving feedback.

Additionally, there is an opportunity to work on a subset of the questions from E1 and E2 in class the day that the exam is released. This in-class opportunity (formerly known as the in-class component) provides time for students to work together on a subset of the exam questions and get clarifying questions. The purpose of the in-class opportunity is to practice answering exam questions, either on your own or with other students. Working with other students in class is also a way for you to learn about how others approach the exam questions. The in-class opportunity is completely optional - students can choose to skip this day and complete the entire exam individually if they choose.

	Complete	Partially Complete	Missing
E1: Exam 1	You pass all 6 questions	You pass 4 or 5 of the questions	You pass fewer than 3 of the questions or you do not submit the exam
E2: Exam 2	You pass all 4 questions	You pass 2 or 3 of the questions	You pass fewer than 2 of the questions or you do not submit the exam

Note: the number of questions are approximate, and will be updated with the exam is finalized.

CYO Assignments

- Pass additional take-home questions on the biology topics presented in weeks 11 & 12.
- Read an additional chapter of the textbook and describe the biological question, why it's important, and how people have solved it as a computational question (750 words).
- Write your own exam questions (& solutions) on the course content. You can be as creative as you want here.

2. Programming Skills

Bio131 is designed to introduce Python programming as a way to implement solutions to computational problems. There is no expectation of programming knowledge prior to this course - everything you need will be taught and practiced in lectures and labs. We also have lots of built-in support for the class - see the support page for some resources.

The work for this theme consists of four programming assignments (P1-P4), some of which are multi-week assignments. The purpose of these assignments is to demonstrate your knowledge of Python programming and your understanding of how biological questions can be posed and answered using computers. Collaboration is highly encouraged for this type of outside work - refer to the collaboration policy for more information.

Each programming assignment has multiple tests that check the outputs of your programs - these are called *unit tests* and they are automatically run when you submit your assignment in GitHub Classroom. The criteria for success corresponds to how many tests your code passes. You can resubmit any of the programming assignments at any time, including after getting feedback. It is extremely important that your code runs without errors - note that if your code does not run because of one or more errors it does not pass any tests

and will be considered Missing.

	Complete	Partially Complete	Missing
P1: Python Practice	11 or more out of 13 tests pass	7-10 tests pass	Fewer than 7 tests pass or you do not submit the assignment
P2: Central Dogma	10 or more out of 13 tests pass	5-9 tests pass	Fewer than 5 tests pass or you do not submit the assignment
P3: Motif Finding	21 or more out of 26 tests pass	15-20 tests pass	Fewer than 14 tests pass or you do not submit the assignment
P4: Alignment	10 or more out of 14 tests pass	7-9 tests pass	Fewer than 7 tests pass or you do not submit the assignment

Note: For P2, you are expected to at least read Part 2 and attempt Exercise 4, even if your assignment is complete before you reach Part 2.

CYO Assignments

- Implement additional lab-like assignments to visualize skew, visualize genome assemblies, and visualize dot plots
- Implement an assignment to assemble a (very small) genome
- Implement an extension of P3 (motif finding) to use Gibbs sampling
- Implement an extension of P4 for local alignment or affine gap alignment
- Implement another problem in the textbook (talk with Anna)

3. Biology and Society

New this year, we will read about and discuss aspects of genetic testing and its influence on society and culture (and vice versa). You will choose one of two books to focus on throughout the semester.

The work for this theme consists of two written reflections (B1 and B2) followed by two discussions during lab. The purpose of the written reflection is to take some time to think about the book and prepare for the in-lab discussion. Therefore, if you submit the written reflection after the in-lab discussion, it will be marked as “Partially Complete.” The purpose of the in-lab discussion is to share your thoughts with other students and also hear a bit about the *other* book you did not choose.

Ideally, you will participate in your lab discussion. However, things come up, and if you cannot make the in-lab discussion (for example due to illness or other circumstances), you must let Anna know before lab. In that case, complete the makeup assignment below, which involves a longer reflection for the in-lab prompt. Note that this should only be completed in rare circumstances, and that you should communicate with Anna about the makeup assignment.

The following table is used for both B1 and B2.

	Complete	Partially Complete	Missing
Written Reflection & Discussion in Lab	You write 250 or more words in response to the writing prompt before lab and you attend lab and discuss the in-lab prompt	You attend lab and discuss the in-lab prompt, but you do not write 250 or more words in response to the writing prompt before lab	You do not attend the discussion
Makeup Assignment (notify Anna)	You write 250 or more words in response to the writing prompt and you write an additional 750 words on the in-lab prompt	You write 750 words on the in-lab prompt, but you do not write 250 or more words in response to the writing prompt	You do not submit the additional reflection

CYO Assignments

- Read the entire book and write a letter to an interested person (real or imaginary) about what you liked about the book, what challenged you about the book, and why the topic is important (750 words).
- Read an excerpt from the other book (the one you did not choose) and imagine the two authors in conversation. What would they say to each other? Where would they agree and where would they disagree? (750 words).
- Write an essay about how computation is used to determine ancestry, and the use of computational biology / bioinformatics in the books (750 words).
- Share what you learned in some creative way (talk with Anna)

4. In-Class Components

In addition to the three themes of outside work, labor is also done in class. There are four additional pieces of work (which are marked either “completed” or “missing”).

- There are two conferences which are lab sections reserved for scheduling one-on-one meetings with me. We will take this time to reflect on your course goals and talk about any of the themes / assignments in the class. These must be completed (in the sense that you have two one-on-one meetings with me; if you cannot meet during the scheduled time we will reschedule).
- During finals week, there will be a finals slot reserved for short presentations from your colleagues (**Monday, May 6th from 1-4pm**). You are required to attend this finals slot (and you can choose to present something - see the CYO assignment below).
- You must complete six of the eight programming labs (L1-L8). Programming labs are an opportunity to work on shorter pieces of code that help you prepare for the programming assignments. The purpose of these labs are to prepare you for the programming assignments and give you additional insight into the lecture content. In many cases, the labs are components of the programming assignments. Lab time is also a place where the TA and I will be available to help with any programming issues you face. Note that you can submit labs that are not complete - the goal here is that you have spent an hour or so working through the material.

	Complete	Partially Complete	Missing
Conference (x2)	You meet with me one-on-one	N/A	You don't meet with me one-on-one
Finals Slot (**Monday, May 6th from 1-4pm**)	You attend the finals slot	N/A	You don't attend the finals slot
Programming Labs	You submit 6 of the 8 programming labs (which are either complete or you worked each one for at least an hour)	N/A	You submit 5 or fewer programming labs

CYO ASSIGNMENT

Share something you learned in a short (10-15 minutes) presentation during the finals week slot. You can talk about anything pertaining to class, in any way you would like (as long as it fills the expected presentation length). You will meet with me to discuss your plan to make sure this CYO assignment has the appropriate scope. Note that all students are expected to attend the presentations, but only students who decided to do this CYO assignment will present.

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Grading Contract

According to the Reed College Guidebook, a grade of an A denotes excellent work, a grade of B denotes above average work, a grade of C denotes average work, a grade of D denotes minimal but passing amount of work, and a grade of F denotes not a passing amount of work.

The eight common assignments (exams E1-E2, programming assignments P1-P4, and book reflections B1-B2) and the four required in-class components (completing the two conference meetings, attending the final exam slot, and completing 6 of 8 programming labs) are designed so that if students complete them, they will earn a B. If you earn a B in the course, you will have learned *a lot* about computational biology. You are expected to submit the work you have done by each deadline (you will be able to resubmit the work - see the deadline policy. **All work for the course must becompleted by the last day of finals (Thursady, May 9th) at 5pm.**

Note that, according to the schedule, the common assignments will be completed by the beginning of Week 12. For the last two weeks, students can choose to revisit the common assignments they wish to improve upon or complete one or more of the choose-your-own (CYO) assignments. The CYO assignments for each theme are listed in the types of work page.

Grading Contract Table

The table below is based off of requirements for a B. To earn higher than a B, you will complete additional CYO assignments. If you partially complete assignments, miss assignments, or miss in-class components, that reduces your grade. The number of missed assignments and in-class components are considered first. For example:

- If you miss one assignment, you will earn no higher than a C- (even if all other work is complete).
- If you miss one of the in-class components, you will earn no higher than a B- (even if all other work is complete).
- Suppose you partially complete an exam and a programming assignment, complete the remaining assignments, and miss 2 in-class components. Missing the 2 in-class components means you will earn a C, even though the two partially complete assignments are in different themes.
- Suppose you partially complete 3 assignments, but have no missing assignments or missing in-class components. You will earn a C-, even though you're not missing work.

Remember, you will have time near the end of the semester to revisit any assignments (including the conferences and the labs).

Earned Grade	Requirements	# Missed Assignments Allowed (8 total)	# Missed In-Class Components Allowed (4 total)
A	Requirements for a B and at least one CYO assignment in each theme (3 total)	0	0
A-	Requirements for a B and at least two CYO assignments	0	0
B+	Requirements for a B and one CYO assignment	0	0
B	**Complete eight common assignments (exams E1-E2, programming assignments P1-P4, and book reflections B1-B2) and the four in-class components (two conference meetings, attending the final exam slot, and completing 6 of 8 programming labs)**	**0**	**0**
B-	Requirements for a B, except 1 assignment is partially completed	0	1
C+	Requirements for a B, except 2 assignments in different themes are partially completed	0	1
C	Requirements for a B, except 2 assignments in the same theme are partially completed	0	2
C-	Requirements for a B, except up to 3 assignments are partially completed	1	2
D	Requirements for a B, except up to 4 assignments are partially completed	2	3
F	Requirements for a D are not met	>2	>3

You will communicate your course plans at multiple points throughout the semester.

- Starter Assignment: in the first week, you will share your reasons for taking the course, what success in the course means to you, and your plans for achieving that success.

- Conferences: In weeks 7 and 12, you will meet with me one-on-one during the lab slot to reflect on your course goals and talk about any of the themes / assignments in the class. In Week 7, we will negotiate your mid-term grade. In week 12, we will negotiate your final grade based on your planned CYO assignments.
- You are welcome to talk with me any time about your progress in the course and how it aligns with your goals. Communication is key.

Illness and Exceptional Circumstances

This also appears on the support page

There may be cases where you cannot attend class for stretches at a time (due to illness, for example). In this case, email me to strategize a successful plan for learning the material. If you miss multiple classes and do not email me, I may reach out to make sure you are OK.

In rare cases, there may be circumstances beyond your control where you are unable to meet the expectations outlined in this syllabus. If there are extenuating circumstances that might impact your academic performance in this class, please inform me as soon as you can to strategize a plan for completing all parts of the course. Additionally, you may want to reach out to the Student Life Office at student-life@reed.edu, phone: (503) 517-7396, office: Eliot 218. The Student Life Office is dedicated to assisting students in accessing campus and support resources, especially during challenging situations.

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Learning Environment

Bio131 is a combination of biology and computer science, and each field has been claimed to be free of racism and prejudice. This is simply not true. Historically, biological discoveries and advances in computer science have been dominated by privileged voices, namely those of white men. Computational biology, while more recent of a field, also lacks diversity along many important axes (including race, gender, nationality, class, sexuality, religion, ability, etc.). To foster an inclusive learning environment:

1. I (Anna Ritz) acknowledge the bias in course materials that stem from systemic privilege, and I aim to make Bio131 content more inclusive each time I teach the course.
2. This course is designed for students with no programming experience, but you may come to Bio131 with varying levels of preparation in both biology and computer science. It is important to remember that this is an introductory course, and my priority is to teach from the ground up. Use the collaboration policy as a way to work with others and help them get comfortable with programming concepts.
3. I will highlight virtual seminars and events hosted by computational biology groups such as the Black Women in Computational Biology Network.
4. Many students will have personal circumstances that may affect their performance in the course. I will work with you to make adjustments to the course schedule as needed, and students should be encouraged to seek guidance on any anticipated or realized issues.
5. Mental and physical health is more important than attending all parts of class. If you miss multiple days of class, I will reach out to make sure you are okay.

Bio131 is a better course when students have a diversity of lived experience and previous knowledge.

Additional Community Rules for Spring 2024

These community rules were submitted in the Starter Assignment and discussed as a class on Feb 12. They are presented in no particular order.

- Respect different skillsets / experience levels
- Be respectful of people's learning
- Don't be afraid to ask questions
- Don't dominate conversations
- Leave tangent Q's to the end of class
- Avoid calling people outwardly wrong
- Keep an open mind
- Promote open communication
- It's OK to take things slow
- It's OK to be wrong - that's part of the learning process
- Let people learn (programming) at their own pace
- Collaborate constructively
- Be helpful, kind, and supportive of each other in lab
- Keep the learning environment supportive
- Make sure everyone is heard

Feedback for the Instructor

Please give me feedback on anything in the syllabus or course, especially with respect to making Bio331 an inclusive learning environment. Let me know if anything makes you uncomfortable in class, if you would like more instruction on a topic, or if you are experiencing a hardship outside of class. Anonymous feedback is available on Moodle, though with a small class your comments may be identifiable.

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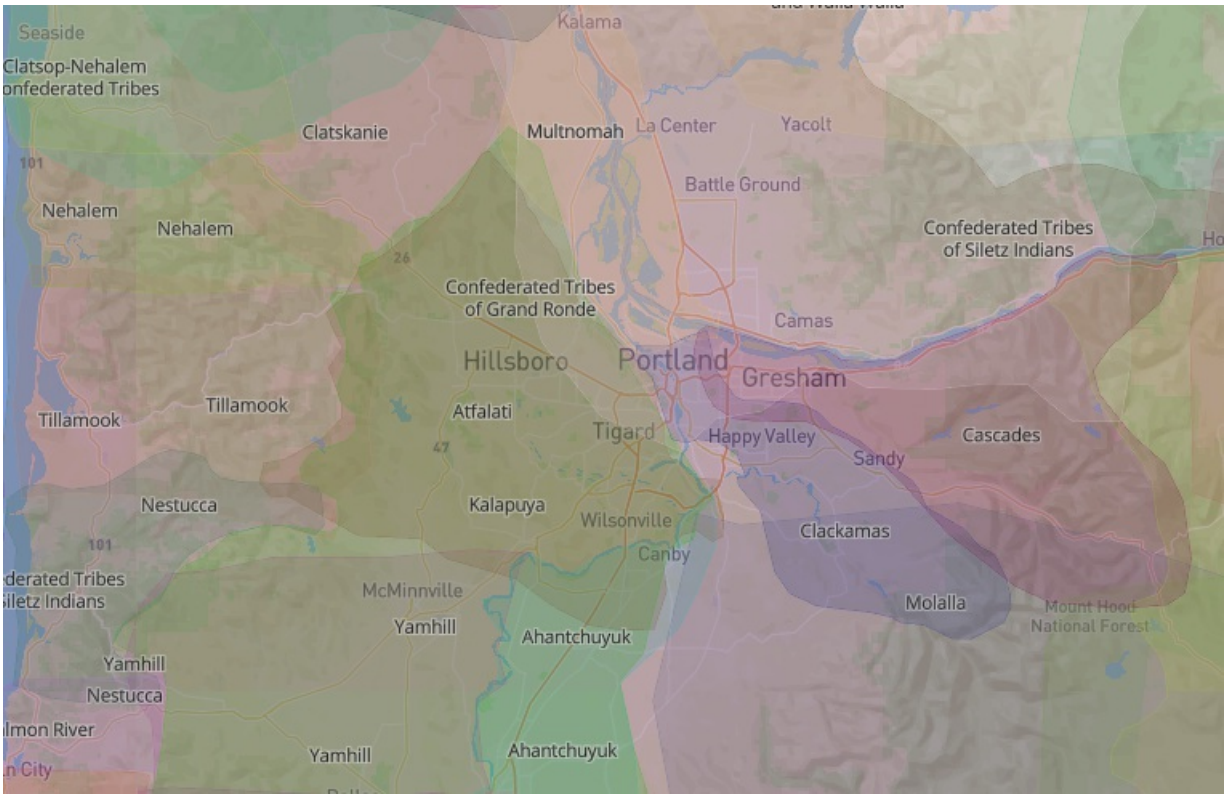
This site uses Just the Docs, a documentation theme for Jekyll.

Land Acknowledgement

As we come together to learn at Reed College, we acknowledge that the territory on which Reed stands is that of Indigenous and Native peoples. The Portland Metro area rests on traditional village sites of the Multnomah, Wasco, Cowlitz, Kathlamet, Clackamas, Bands of Chinook, Tualatin, Kalapuya, Molalla, and many other tribes who made their homes along the Columbia River (Portland Indian Leaders Roundtable, 2018). Native lands have been taken through hundreds of breaches of treaty laws, and in 1953 more then sixty tribes in Oregon were terminated by the federal government which removed millions of acres of land from Indigenous stewardship (The Native American Community in Multnomah County: An Unsettling Profile). This statement is one small step in acknowledging the history that brought us to reside on this land. Portland also has a vibrant and diverse Indigenous community and has the ninth largest urban Native American population in the US. We honor the present Indigenous communities in the area. Visit native-land.ca to explore an interactive map of Indigenous lands.



Screenshot from native-land.ca

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- **Remember the skills that you bring to the class.** Everyone comes to Bio131 with a different set of knowledge and skills, and it might have nothing to do with biology or programming. Are you creative? Do you like to solve problems? Are you good at multitasking? Do you like to collaborate, or work independently? These (and many others) are examples of strengths you bring to Bio131.
- **Start the programming assignments early.** The time you spend on each assignment might vary drastically, depending on how much time you spend working through Python errors.
  - Have a plan for the work you need to do for each component of the assignment.
  - Work through problems on paper if you are confused with a concept.
  - After each step, no matter how small, check that your code still runs. Remember that if your code does not run due to an error it is considered "Missing" according to the criteria.
  - If you're stuck at *any point* (trying to figure out what to do first, your code has errors you just can't figure out, the tests aren't passing and you can't figure out why), email me or come to student hours for help.
- **This course is cumulative** – topics build upon each other throughout the semester, and attendance is important (see the attendance policy). Let me know if you miss a lecture or a lab to get caught up. There is no penalty for missing lecture or lab according to the grading contract, but the class is designed so that the in-class components help you complete the work outside of class.
- **Working collaboratively is fun!** If possible, try to work with others on the assignments within the limits outlined in the collaboration policy.
- **When in doubt, ask.** Asking for help is sometimes unintuitive, but a little clarification goes a long way.
  - If you have the question, others will probably have the same question. Ask early so I can communicate the answers to the rest of the class.
  - Sometimes I make mistakes! Your question might help me fix a typo.
  - If you have no idea how to start a problem (which happens!), stop by student hours or email me.
  - If you feel like you are falling behind and want to resort to copying material or using generative AI, come talk with me to get the support you need.
- **Start the assignments early.** Really.

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Change Log

The purpose of a change log is to document all major changes to some code/website/etc. Starting on January 22, all major changes will be documented in this change log. If you want to see *all* the changes made to this website since it was first created, take a look at the GitHub commit log.

2024-04-11

Changed the number of questions required for Complete/Partial/Missing E2.

2024-04-04

Added finals slot information. All work for courses must be completed by the last day of finals at 5pm.

2024-04-02

Updated P3 & P4 number of tests for complete, partial, and missing.

2024-02-23

Some important changes regarding E1 & E2 and B1 & B2.

- Exams are now determined to be complete, partially complete, or missing based on the take-home portion. The in class component is now an optional opportunity for students to work together on a subset of the exam questions and get clarifying questions. See the Biology and Computational Thinking section for more details.
- There is now a clarification for the book reflections (B1 & B2) in the case that students cannot attend the in-lab discussion. In that case, after notifying Anna, students can complete both the writing prompt reflection and a longer reflection on the in-lab prompt. See the Biology and Society section for more details.

2024-02-12

- Changed the number of required tests for complete, partially complete, and missing assignments for P2: Central Dogma (see the types of work page).
- Added the community rules that were submitted as part of the starter assignment (see the learning environment page).

2024-02-02

- Changed office hours to be Tu 10-11 and Th 3-5pm, Biology 200B

2024-01-28

- Changed the number of required tests for complete, partially complete, and missing assignments for P1: Python Practice (see the types of work page).

2024-01-23

- Lecture room changed to Chem 301

2024-01-21

Content is set; ready for class tomorrow.

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