San José State University
Computer Science Department
Computer Science / Biology 123B: Bioinformatics II, Fall 2023

Course and Contact Information

Instructor:	Philip Heller
Office Location:	MacQuarrie Hall 211
Email:	philip.heller@sjsu.edu
Office Hours:	Tu 10:30 – 11:30 in person
	Wed 1:15 – 2:15 on Zoom: https://sjsu.zoom.us/j/89022858217

Class Days/Time:	Tu/Th 9-10:15
Classroom:	MacQuarrie Hall 422
Prerequisite:	CS/BIOL 123A

Course Description

Advanced Bioinformatics algorithms, tools, databases. Biological background; protein structure/function; sequencing technology; sequence identification; transcriptomics; metagenomics; CRISPR. Possible additional topics: functional genomics; protein networks; drug discovery; pathway analysis; immunoinformatics; analysis pipelines; machine learning applications. Project applying advanced approaches to real-world problems.

Course Format

Sessions will be either lecture format, hands-on exercises, or a combination.

Course Learning Outcomes

Upon successful completion of this course, students will be able to:

- List the 4 levels of protein structure.
- Identify common sequencing technologies, and select bioinformatic analysis strategies for data generated by those technologies.
- Use appropriate gene function identification approaches to predict the function of nucleotide and protein sequences.
- Interpret transcriptomic, metagenomic, and metatranscriptomic data.
- Summarize the stages of CRISPR-Cas immunity, use public software tools to find novel CRISPR systems, and clarify CRISPR gene editing.

Texts/Readings

Recommended Textbook

"Understanding Bioinformatics" by Marketa Zvelebil and Jeremy Baum, 1st edition, Garland Science, 2008, ISBN 0-815-34024-9.

Other technology requirements / equipment / material

Students must bring a charged wifi-enabled laptop computer to all in-person sessions.

Course Requirements and Assignments

Homework Assignments: Homework assignments must be uploaded to Canvas by the due date/time. No late homework will be accepted except by prior arrangement with the instructor or in cases of documented emergency.

Lab Reports: Lab reports must be uploaded to Canvas by midnight on the day after the lab session. No late reports will be accepted except by prior arrangement with the instructor or in cases of documented emergency.

Term Project: Students will do an individual term project. Students in CS 123B must do a project that includes programming, in the language of their choice. Students in Biology 123B may do the same, or may do a project involving acquiring published data and then analyzing the data using 3rd-party bioinformatics tools. Projects include a written report and an oral presentation. Oral presentations will be given in the last 4 class sessions and during the final exam slot: Thursday Dec 14 from 7:15 to 9:30 AM.

Midterm Exams: There will be 2 midterm exams. Note that the exam dates given in the schedule below are approximate and are subject to change.

Grading:

Homework: 20%
Labs: 20%
Midterm 1: 20%
Midterm 2: 20%
Project: 20%

At least	Letter Grade
97%	A plus
93%	A
90%	A minus
87%	B plus
83%	B
80%	B minus
77%	C plus
72%	C
70%	C minus

67%	D plus
62%	D
60%	D minus
<60%	F

Office Hours

Many students are shy about coming to office hours. Please don't be! They are for you! It's a great chance for you and the professor to get to know each other. You can ask specific questions about homework, labs, or your project. Or you can just hang out and talk about whatever is on your mind.

If you want to meet, it's best to meet during office hours if you can, but don't cut another class. You are welcome to email Philip.heller@sjsu.edu to arrange a different time.

For the Wednesday zoom sessions, you have to have your camera on.

Classroom Protocol

Students are expected to attend all class sessions for their assigned section unless they have a personal emergency. During lectures, students' devices may only be used for course-related purposes such as taking notes. Disruptive behavior, including using devices for purposes unrelated to the course, is not allowed. The consequence for the first incident of disruption is a reduction of 1/3 grade point from the final letter grade (e.g. B minus becomes C plus). The consequence for the second incident is a reduction of 2/3 grade point from the final letter grade (e.g. B minus becomes C). The consequence for the third incident is an F in the course. All incidents will be reported to the university, which may impose further sanctions.

Academic Integrity

Students are expected to be familiar with the University's Student Conduct Code: https://www.sjsu.edu/studentconduct/docs/SJSU-Student-Conduct-Code.pdf. Cheating, plagiarism, and other forms of misconduct will not be tolerated and will have severe consequences. All prose submitted must be in the student's own words. Text composed by any person or AI other than the student will not be accepted, *even if it is quoted and cited,* unless the assignment specifically says otherwise.

The consequence for the first incident of cheating or plagiarizing is zero points on the assignment or exam, and a reduction of a full grade point from the final letter grade (e.g. B minus becomes C minus). The penalty for the second incident is an F in the course. All incidents will be reported to the university, which may impose further sanctions.

All course materials, including slides, homework assignments, lab assignments, exams, and instructor's solutions, are the instructor's intellectual property and may not be distributed without permission. Distribution includes posting to social media sites and Chegg. Distribution is grounds for failing the course, and all incidents will be reported to the university, which may impose further sanctions.

University Policies

Per University Policy S16-9 (http://www.sjsu.edu/senate/docs/S16-9.pdf), relevant university policy concerning all courses, such as student responsibilities, academic integrity, accommodations, dropping and adding, consent for recording of class, etc. and available student services (e.g. learning assistance, counseling, and other resources) are listed on Syllabus Information web page (http://www.sjsu.edu/gup/syllabusinfo), which is hosted by the Office of Undergraduate Education. Make sure to visit this page to review and be aware of these university policies and resources.

College of Science COVID-19 and Monkeypox Safety

Students registered for a College of Science (CoS) class with an in-person component should view the CoS COVID-19 and Monkeypox Training slides for updated CoS, SJSU, county, state and federal information and guidelines, and more information can be found on the SJSU Health Advisories website. By working together to follow these safety practices, we can keep our college safer. Failure to follow safety practice(s) outlined in the training, the SJSU Health Advisories website, or instructions from instructors, TAs or CoS Safety Staff may result in dismissal from CoS buildings, facilities or field sites. Updates will be implemented as changes occur (and posted to the same links).

Computer Science / Biology 123B Fall 2022 Course Schedule

Course Schedule

All dates are approximate and subject to change, except for holidays and final exams. If a midterm exam date changes, at least 1 week's notice will be given via a Canvas Announcement.

Week	Date	Topics, Readings, Assignments, Deadlines
1	8/22	Course mechanics.
1	8/24	Statistics overview.
2	8/29	Computing overview. Hidden Markov Models.
2	8/31	Hidden Markov Models.
3	9/5	Hidden Markov Models.
3	9/7	Hidden Markov Models.
4	9/12	Protein Hidden Markov Models.
4	9/14	Protein Hidden Markov Models.
5	9/19	Protein Hidden Markov Models.
5	9/21	Sequencing technology.
6	9/26	Sequencing technology.
6	9/28	CRISPR.
7	10/3	CRISPR.
7	10/5	Guest speaker.
8	10/10	Review for Midterm 1.
8	10/12	Midterm 1.
9	10/17	Astronaut genomics.
9	10/19	Conserved domains. ARBitrator.
10	10/24	ARBitrator.
10	10/26	Codon bias.
11	10/31	Codon bias.
11	11/2	Metagenomics.
12	11/7	Metagenomics.
12	11/9	Guest speaker.

Week	Date	Topics, Readings, Assignments, Deadlines
13	11/14	Review for Midterm 2.
13	11/16	Midterm 2.
14	11/21	Project presentations.
14	11/23	Thanksgiving.
15	11/28	Project presentations.
15	11/30	Project presentations.
16	12/5	Project presentations.
16	12/14	Project presentations: 7:15 – 9:30 PM