San José State University
Computer Science Department
Computer Science / Biology 123A: Bioinformatics II, Spring 2025

Course and Contact Information

Instructor: James Casaletto
Office Location: Duncan Hall 282
Email: james.casaletto@sjsu.edu
Office Hours: Tues 08:00 – 09:00 (in person); Weds 12:00 – 13:00 (Zoom link - https://sjsu/zoom.com/james.casaletto) by appointment only (https://calendly.com/jcasalet-sjsu/30min)
Class Days/Time: Tu/Th 10:30 – 11:45
Classroom: Duncan Hall 450
Prerequisite: CS 46B or BIOL 31

TA: Patricia Saito (patricia.saito@sjsu.edu)

Course Description

Introduction to bioinformatics algorithms, tools, databases. Biological background; central dogma; biological open data sources and formats; classification; pairwise alignment; BLAST; phylogenetics; big-O analysis; additional topics may include next-gen sequencing.

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:

- Define the central dogma of molecular biology
- Identify and describe sources of open biological datasets
- Use supervised machine learning algorithms to classify gene expression data.
- Align pairs of sequences using Smith-Waterman and Needleman-Wunsch algorithms.
- Use BLAST to identify DNA, RNA, and/or protein sequences.
- Induce phylogenetic trees using WPGMA algorithm.
- Characterize the runtime of an algorithm using big-O analysis.

Recommended Textbook

"Introduction to Bioinformatics" by Arthur M. Lesk, 5th edition, Oxford University Press, 2019, ISBN 13: 9780199277872.

Other technology requirements / equipment / material

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

Course Requirements and Assignments

Hands-on Assignments:

Hands-on 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.

Quizzes:
Quizzes on canvas will be assigned to reinforce lecture and reading material. They may be retaken as many times as you like.

Term Project:
Students will do a term project individually or in teams of 2. Graduate students and students in CS 123A must do a project that includes programming, in the language of their choice. Students in Biology 123A 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.

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.

Final Exam:
The final exam will be given on the date and at the time assigned by the university for this class.

Grading:

Hands-on: 30%
Exams: 30%
Quizzes: 10%
Term project: 30%

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

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-2016.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 anyone other than the student will not be accepted, *even if it is quoted and cited*. The penalty 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 Office of Student and Ethical Conduct.

All assignments submitted are expected to be the students' own original work. The instructor may, at any time, ask a student to explain the meaning of any part of any answer that they submit. If the student can't explain the answer to a question, the penalty for the first incident will be loss of all points on the question. The penalty for the second and subsequent incidents will be loss of all points on the assignment and a report to the Office of Student and Ethical Conduct. A similar policy will apply to the project report and any related code; the policy will be explained in the project assignment doc later in the semester.

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 123A Spring 2025 Course Schedule

Course Schedule

All dates and topics are estimates and are subject to change. Date changes for exams will be announced 2 weeks in advance. Guest speakers often reschedule at the last minute!

Week	Date	Topics
1	1/23	Course intro
2	1/28	bioinformatic data
2	1/30	Central dogma I
3	2/4	Central dogma II
3	2/6	Open data repositories and formats
4	2/11	Classification I
4	2/13	Classification II
5	2/18	Review I
5	2/20	Midterm 1
6	2/25	Pairwise alignment I
6	2/27	Pairwise alignment II
7	3/4	BLAST I
7	3/6	BLAST II
8	3/11	Phylogenetics I
8	3/13	Phylogenetics II
9	3/18	Big-O analysis
9	3/20	Guest speaker
10	3/25	Review II
10	3/27	Midterm II
11	4/1	Spring break
11	4/3	Spring break
12	4/8	Next-gen sequencing I
12	4/10	Next-gen sequencing II
13	4/15	Open science

Week	Date	Topics
13	4/17	Guest speaker
14	4/22	Student preso I
14	4/24	Student preso II
15	4/29	Student preso III
15	5/1	Student preso IV
16	5/6	Student preso V
16	5/8	Final review
17	5/13	No class (finals prep)
17	5/15	No class (finals prep)
18	5/19	Final exam 10:45am – 12:45pm