SJSU SAN JOSÉ STATE UNIVERSITY

College of Science · Computer Science

Bioinformatics I

CS 123A

Spring 2026 Section 06 In Person 3 Unit(s) 01/22/2026 to 05/11/2026 Modified 01/22/2026

Contact Information

Instructor: Dr. Wendy Lee (wendy.lee@sjsu.edu)

Class Schedule

- M/W 12 pm -10:15 pm in Industrial Studies (IS 215)

Instructor's Office Hours

- Wednesday 1:30 - 2:30 PM (MH 413) & Thursday 10:00 - 11:00 AM (Zoom)
- Schedule appointment @ https://calendly.com/wendy-lee-sjsu/spring-2026-office-hours (https://calendly.com/wendy-lee-sjsu/fall-2025-office-hours)

Course Information

- This is an in-person course
- Class time will be spent either in "lecture" mode or in "lab" mode, as explained in "Class Protocol" in this document.
- You are required to bring your wireless laptop to each class.
- Exams will be in-class, hand-written, and closed-book.
- Course materials, such as the syllabus, handouts, notes, hands-on exercises, project instructions, etc., can be found on the Canvas Learning Management System at https://sjsu.instructure.com (https://sjsu.campusconcourse.com/).
- You are responsible for regularly checking the Canvas messaging system for updates.

Course Description and Requisites

Introduction to algorithms, tools, and databases of Bioinformatics. Biological foundations: central dogma; sequence databases; pairwise alignment algorithms and tools; Blast; phylogenetics. Possible additional topics: protein structure, multiple sequence alignment, next-gen sequencing, epigenetics, CRISPR. Project applying these approaches to real-world problems.

Prerequisite(s): CS 46B or BIOL 31, or instructor consent; Allowed Majors: Computer Science, Data Science, Software Engineering, Biology, Chemistry or MS Bioinformatics.

Letter Graded

Classroom Protocols

- **Dual-Purpose Classroom**: The classroom will be used as a dual-purpose room. It can be a regular lecture room, or it can be a computer laboratory for hands-on exercises.
- **Lecture Mode:** Students are expected to listen and follow the lecture. Be considerate of your classmates and follow the lecture. Do not use the computer and/or talk to your neighbor.
- **Lab Mode:** Use the computers. Work collaboratively on the Hands-On problems and share your ideas and solutions with your classmates.
- We shall alternate between the two modes. A typical class will begin with a lecture (Lecture Mode) followed by a hands-on (Lab Mode).
- Regular class attendance is highly recommended and strongly encouraged.
- Please arrive at class on time so you can benefit fully from the course experience, and do not disturb classmates or the instructor while class is in session.
- Students are responsible for knowing all materials covered in class lectures, readings, assignments, and other course-related work.
- Please do not use mobile phones during class time. Laptops, tablets, and other devices should only be used for course-related purposes.

Program Information

Diversity Statement - At SJSU, it is important to create a safe learning environment where we can explore, learn, and grow together. We strive to build a diverse, equitable, inclusive culture that values, encourages, and supports students from all backgrounds and experiences.

Course Learning Outcomes (CLOs)

Upon successful completion of this course, students will be familiar with the following concepts and will be able to apply them in appropriate situations:

1. Pairwise and multiple sequence alignments.
2. Computation and interpretation of sequence homology.
3. Phylogenetic trees, and the algorithms that compute them (UPGMA, Neighbor-Joining).
4. Public DNA and protein databases, and how to use them.
5. CRISPR technology and bioinformatics techniques for designing guide RNA.
6. Next-generation DNA sequencing technology and data analysis.

Course Materials

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

Other Readings: Additional course readings, examples, exercises, etc. will be assigned and will be provided by the instructor.

Course Requirements and Assignments

Hands-On Classwork (10%): These assignments will be in class and graded on completion. The exams will contain questions based on the hands-on assignments, so it is highly recommended that students put effort into them.

Problem Sets (15%): The purpose of the assignments is to develop your understanding of the material and your skills in problem-solving.

Term-Project (20%): Information on the term project can be found on the course website in Canvas. It is a group project. Each group consists of two students. Here are the key deliverables and due dates:

- **Team Formation**: Wednesday, March 4, 2026.
- **Project proposal**: Wednesday, March 18, 2026.
- **Progress Report**: Monday, April 13, 2026.
- **Final Project**: Wednesday, May 6, 2026.
- **Presentation**: Each group gives a 10-minute, in-class presentation on May 6 or May 11, 2026, during class time..

Term Exams (30%):

- **Exam One** (15%): Wednesday, March 11, 2026.
- **Exam Two** (15%): Monday, April 20, 2026.
- Exam One and Exam Two are each one hour and fifteen minutes long. All exams are in-class, closed-book, and comprehensive. Make-up exams will be given only at the instructor's discretion.
- **Note:** If you fall behind, you will likely do poorly

Final Exam (25%): A cumulative Final Exam will be given on **Monday, May 18, 2026 from 10:45 AM-12:45 PM.** If there is a time conflict, please inform the instructor at least two weeks in advance for rescheduling.

Grading Information

Grading calculation will be based on the following:

- Hands-on Assignments (10%)
- Assignments/Problem Sets (15%)
- Term Project (20%)
- Term Exam One (15%)
- Term Exam Two (15%)
- Final Examination (25%)

Incomplete work: Points will be deducted for incomplete question responses and solutions that are partially functional. Consult individual assignment for details of point allocation for each problem.

Late assignments: No late homework will be accepted. However, under exceptional circumstances, one problem set per student might be accepted late. It will need to be handed in prior to the following class meeting and will be graded with 30% off. Such an extension should be requested from the instructor.

Makeup Exams: You must submit only your own work on exams. Makeup exams will only be given in cases of illness (documented by a doctor) or in cases of documentable, extreme emergency.

Grading Scale:

Point Range	Letter Grade	Point Range	Letter Grade
97.0 – 100	A plus	72.0 – 76.99	C
93.0 – 96.99	A	70.0 – 71.99	C minus
90.0 – 92.99	A minus	67.0 – 69.99	D plus
87.0 – 89.99	B plus	62.0 – 66.99	D
82.0 – 86.99	B	60.0 – 61.99	D minus
80.0 – 81.99	B minus	<60.0	F
77.0 – 79.99	C plus		

Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally three hours per unit per week) for instruction, preparation/studying, or course-related activities. Other course structures will have equivalent workload expectations as described in the syllabus.

University Policies

Per University Policy S16-9 (PDF) (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 the Syllabus Information (https://www.sjsu.edu/curriculum/courses/syllabus-info.php) web page. Make sure to visit this page to review and be aware of these university policies and resources.

Course Schedule

The course schedule is subject to change with fair notice. Changes will be announced on Canvas.

Week	Date	Topics
1	1/26	Syllabus. Introductions. Course Expectations. Bioinformatics: historical development, current challenges. *Hands-On #1*
1	1/28	Background: Molecular biology. *Hands-On #2*
2	2/2	Background: Molecular biology. *Hands-On #2*
2	2/4	Background: Molecular biology and Bioinformatics Databases. *Hands-On #3*
3	2/9	**Homework #1 due.** Bioinformatics Databases. *Hands-On #3*
3	2/11	Homework #1 answers. Pairwise alignment. *Hands-On #4*
4	2/16	Pairwise sequence alignment. *Hands-On #5*
4	2/18	Pairwise sequence alignment. *Hands-On #5*
5	2/23	**Homework #2 due**. Pairwise sequence alignment. *Hands-On #6*

5	2/25	Homework #2 answers. Multiple sequence alignment.
6	3/2	Multiple sequence alignment. *Hands-On #6*
6	3/4	**Project Team Formation**. Multiple sequence alignment.
7	3/9	Midterm Review
7	3/11	**Midterm Exam #1**
8	3/16	Phylogenetic inference
8	3/18	Phylogenetic inference. **Project Proposal Due.**
9	3/23	Exam #1 answers. **Homework #3 due**.
9	3/25	Homework #3 answers. Phylogenetic inference.
10	3/30	**Spring Break - no classes**
10	4/1	**Spring Break - no classes**
11	4/6	Phylogenetic inference.
11	4/8	**Project Progress Report due**. Sequence Motifs. *Hands-On #7*
12	4/13	**Homework #4 due**. Sequence Motifs.
12	4/15	Homework #4 answers. Midterm Review
13	4/20	**Midterm Exam #2**

13	4/22	CRISPR. *Hands-On #8*
14	4/27	CRISPR. Exam #2 answers.
14	4/29	Next Generation Sequencing. *Hands-On #9*
15	5/4	Next Generation Sequencing. *Hands-On #10*
15	5/6	**Final Project due**. Project presentations
16	5/11	Project presentations
17	5/18	**Final Exam. Monday 10:45 AM-12:45 PM**