San José State University
Computer Science Department
CS/BIOL 123A Bioinformatics I, Sec 03 & 04, Spring 2026

Course and Contact Information

Instructor:	Leonard Wesley
Office Location:	MH 212
Telephone:	408.924.5287 (Office, however, I will not be on campus very frequently during the Spring 2026 semester.)
Email:	Leonard.Wesley@sjsu.edu
Office Hours:	Wednesdays 7:00AM – 9:00AM, Zoom Link For Office Hours For Spring 2026 https://sjsu.zoom.us/j/82442818722?pwd=nwmaLCQzpwLaVqHDD6ay9t72tVPjbV.1 PASSCODE: 016303
Class Days/Time:	Section 03: Tue and Thur 9:00 AM –10:15 AM Section 04: Tue and Thur 10:30 AM –11:45 AM
Classroom:	MH 422
Prerequisites:	BIOL 30 and BIOL 31, or CS 46A and CS 46B

Catalog Course Description:

Introduction to the main public domain tools, databases and methods in bioinformatics. Analysis of algorithms behind the most successful tools, such as the local and global sequence alignment packages, and the underlying methods used in fragment assembly packages. Solution of complex biological questions requiring modification of standard code.

Learning Outcomes:

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

1. SLO-1 BIOLOGY BASICS: Review the biology central dogma, and review prerequisite course information about the structure and function of DNA, RNA, and Proteins.

2. SLO-2 BIOINFORMATICS DBs: Describe the structure of bioinformatics-related DBs and how they function to analyze sequence and related biological data. Navigate through various DBs to research and answer questions of interest, identify genes, and analyze complex genomes.
3. SLO-3 ALIGNMENT: Describe and use pairwise and multiple sequence alignment algorithms to conduct local, global, and semiglobal alignments. Understand and use BLAST and advanced DB searching methods.
4. SLO-4 PHYLOGENY: Build, understand, and use molecular phylogenetic trees. Understand and answer questions about evolution using molecular phylogenetic trees.
5. SLO-5 BIOINFORMATIC FRONTIERS: Understand the theory, practice, and use of the CRISPR-CAS9 gene editing technology.

Required Texts/Readings:

Textbook

Bioinformatics and Functional Genomics Edition: 3rd Year 2015
Author: Pevsner
ISBN 13: 978-1-118-58178-0 Price ranges from $39(Paperback) to $73(e-Book)

Other Readings

Introduction To Bioinformatics by Arthur M Lesk, 4th Edition, Oxford University Press, 2014, ISBN-13: 978-0-19-965156-6

Bioinformatics: A Practical Guide To The Analysis of Genes and Proteins by Andreas D. Baxevanisad B.F. Francis Oullette, 3rd Edition, Wiley Interscience, 2005, ISBN-10: 0-471-47878-4 (cloth)

Computational Resources:

Students are required to make sure that they have access to sufficient UNIX, Windows, or Mac based computational resources (e.g., computers and software) to carryout assignments in the course. An attempt to offer the course in a classroom with sufficient computation resources will be made by the department to support classroom instruction and demonstrations. However, students should be prepared to bring their portable laptops to class.

Course Requirements and Assignments:

Course Logistics

Students should expect to spend approximately nine (9) hours per week (on average) outside of the classroom preparing for and completing the assigned course work. This

includes reading papers, viewing videos as appropriate, completing homework and programming exercises, and so forth. The amount of time that a student actually spends studying and completing course work will depend on individual skills and the time that the student actually allocates to the course. The nine (9) hours per week estimate is based on previous experiences of the instructor and students. So please plan and schedule accordingly.

Previously, some students have asked for special exceptions to policies and procedures for this course. An example includes asking the instructor for extra assignments or work to help improve a grade. Even if such a request is reasonable in the opinion of the instructor, no exception will be given to a student unless the same opportunity can be made available to the entire class, and does not constitute significant extra work on the part of students, instructors, graders and so forth. Students should have no concern that other students will receive special exceptions that will not be made available to the entire class.

NOTE: University policy (F69-24) states that "Students should attend all meetings of their classes, not only because they are responsible for material discussed therein, but because active participation is frequently essential to insure maximum benefit for all members of the class. Attendance per se shall not be used as a criterion for grading." However, attendance will be required in order to complete and submit many in-class exercises, quizzes, and exams. Should students miss or leave early from one or more classes, students are responsible for knowing and understanding any and all course subject matter, assignments, exercises, instructions and so forth that are presented or discussed during official scheduled class time.

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, including but not limited to internships, labs, and clinical practica. Other course structures will have equivalent workload expectations as described in the Syllabus/Syllabus.

Quizzes and Exams:

There will be three quizzes and one midterm exam all of which will count toward a student's final grade as specified in the "Grades" section below. During quizzes and exams, communication with other individuals via any means is strictly prohibited without the express permission of the instructor. Violations will be met with the full impact of SJSU's academic integrity policy and procedures.

Full Semester Project:

A full semester team-based challenging project will take the place of a cumulative final exam. The grade that each member of the team received might not be the same for all team members. Rather, it will depend on the amount and quality of the contribution from

each team member. See the rubric for the semester project for more details about the grading.

In-Class Exercises

There will be four in-class exercises where groups of two to four will be formed to work on an assigned exercise. In-class participation is mandatory, and an attendance sign-up sheet will be passed around to verify participation. The assigned exercises are intended to reinforce learning and understanding of previous lecture, homework, and programming assignment subject matter by providing hands-on experience with completing the provided assignment. A supplement document named “In-Class Exercise Procedure.pdf” is available on Canvas in the “Course Procedures & Requirements” section on the course main Canvas landing page. The “In-Class Exercise Procedure.pdf” document describes the general organization of all in-class exercise assignments as well as the procedure for completing and submitting all in-class exercises. The “In-Class Exercise Procedure.pdf” document should be treated as part of the official Syllabus for this course.

Reading, Homework, Programming, Participation Assignments

Graded reading, homework, programming, class participation and brief course feedback assignments will be assigned frequently. For homework assignments, only one or two questions might be graded depending on the grading workload of the instructor. For non-programmer types (e.g., Biology. Biochemistry, Chemistry, … majors), comparable non-programming tasks will be assigned for “programming assignments.” All graded assignments will count toward a student’s final course grade. Programmer types (e.g., CS, Bioinformatics, Software Engineering, Data Science, … majors) must submit programming assignments as per specifications that are described in the “Programming Assignment Guidelines.pdf” document on Canvas.

Questions and Regrade Requests

All questions about grading and re-grade requests must be presented to the instructor within two weeks from the date the graded assignments, exercises, and exams are returned/posted to the class or by the last day of instruction for the semester (whichever is sooner). Assignments, quizzes, and exams will typically be returned (i.e., posted) to Canvas, or manually handed back in class. General questions about the topics covered in assignments, exams, exercises, programming assignments, and the course are permissible at any time.

Tentative course calendar of assignment due dates & exam dates:

(Please note that course calendar below, and its content is "subject to change with fair notice")

Week and Class Mtg #	Tue	Thur	Module # & Name	TOPIC	Assignment See Canvas For Module & Weekly Assignment Details and Due Dates
Week 1	N/A	1/22	#1 Biology Basics	1/22 Intro To Course: -Topics, learning objectives, course logistics, Instructor background - Syllabus Intro to molecular cell biology, DNA, RNA, and the Biology central dogma. - DNA Replication, Transcription, and Translation	Learning Module #1
Week 2	1/27	1/29	#1 Biology Basics	1/27: DNA Réplication, Transcription, Translation, Proteins 1/29: - NCBI Gene, Protein, and Nucleotide DBs	Learning Module #1

Week 3	2/3	2/5	#2 Bioinformatics DBs	2/3: - NCBI Gene, Protein, and Nucleotide DBs 2/5: - Possible Projects - Entrez DB - Ensembl DB	Learning Module #2
Week 4	2/10	2/12	#2 Bioinformatics DBs	2/10: - Entrez DB - Ensembl DB 2/12: - **In-Class Exercise 1 Covers Topics From Week 1 thru Week 4**	Learning Module #2
Week 5	2/17	2/19	#2 Bioinformatics DBs	2/17: - Ensembl DB - UCSC Genomic DB 2/19: - UCSC Genomic DB	Learning Module #2 The deadline for students to Add or Drop classes via MySJSU with no petition is February 17 (per University Policy S22-6)
Week 6	2/24	2]/26	#3 Alignment	2/24: - Pairwise Alignment 2/26: - **Quiz 1 (~45 mins): Covers Topics From Week 1 thru Week 5**	Learning Module #3
Week 7	3/3	3/5	#3 Alignment	3/3: - Pairwise Alignment 3/5: - Pairwise Alignment	Learning Module #3

Week 8	3/10	3/12	#3 Alignment	3/10: - Multiple Sequence Alignment 3/12: **In-Class Exercise 2** - **Covers Topics In Class Exercise 1 thru Week 6**	Learning Module #3
Week 9	3/17	3/19	#3 Alignment	3/17: - Multiple Sequence Alignment 3/19: **Midterm (Full period): Covers Topics Week 1 thru Week 8**	Learning Module #4
Week 10	3/24	3/26	#3 Alignment	3/24: - Multiple Sequence Alignment 3/26: - Multiple Sequence Alignment	Learning Module #4
	3/30	**4/3**		**SPRING BREAK**	
Week 11	4/7	4/9	#4 Phylogeny	4/7: **In-Class Exercise 3 Covers Topics In Class Exercise 1 thru Week 6** 4/9: - Molecular phylogenetic Trees	Learning Module #4
Week 12	4/14	4/16	#4 Phylogeny	4/14: - Team work on projects 4/16: **Quiz 2 (~45 mins): Covers Topics Week 5 thru Week 11**	Learning Module #4

Week 13	4/21	4/23	#5 Bioinformatic Frontiers	4/21: - Introduction CRISPR-CAS9 4/23: - CRISPR-CAS9 cont.	Learning Module #5
Week 14	4/28	4/30	#5 Bioinformatic Frontiers	4/28: - CRISPR-CAS9 cont. 4/30: - CRISPR-CAS9 cont.	Learning Module #5
Week 15	5/5	5/7	#5 Bioinformatic Frontiers	5/5: **In-Class Exercise 4 (Work on Projects, Q&A)** 5/7: **Quiz 3 (~45 mins): Covers From Quiz 2 thru End Of Semester**	Learning Module #5
			Final Project Report and Code Due To Canvas **Wednesday May 13, 2026 By 11:59PM** **No Final Exam.** **The Project Takes The Place Of The Final Exam**		

SCHEDULE FOOTNOTES:
NONE AS OF SPRING 2026

Grades *

WRITTEN HOMEWORK (4 at 20 pts each)	80 pts
QUIZZES (3 at 50pts each)	150 pts
MIDTERM	100 pts
IN-CLASS EXERCISES (4 at 50pts each)	200 pts
WEEKLY FEEDBACK (14 at 5pts each)	70 pts
PROGRAMMING ASSIGNMENTS (2 @ 50pts each)	100 pts
FINAL PROJECT REPORT & CODE	300 pts
Total Course Points	= 1,000 pts Total

* The total points for each category might change depending on the number of project teams and assignments. The instructor reserves the right to adjust, with sufficient advanced notice,

Note that “All students have the right, within a reasonable time, to know their academic scores, to review their grade-dependent work, and to be provided with explanations for the determination of their course grades.” See University Policy F13-1 at http://www.sjsu.edu/senate/docs/F13-1.pdf for more details.

Classroom Protocol:

When Off-Campus (e.g., via Zoom):

Students must make sure that their microphone is muted at all times unless instructed otherwise, e.g., to ask a question. Most of the time, interactions will be via Chat or responding to Polls.

During quizzes and exams, computer cameras MUST BE ON and the student visible at all times during the quiz or exam. Failure to have a working camera during exams will result in a minimum 50% reduction of the quiz or exam score.

When On Campus:

<THE OFFICIAL ASSIGNED CLASSROOM> is a dual purpose room. It can be a regular lecture room or a computer laboratory. Please note that “or” in the last sentence is exclusive. In other words, SCI 311is never a lecture room AND a computer lab at the same time.

Lecture Mode: This is when *<THE OFFICIAL ASSIGNED CLASSROOM>* is used as a regular lecture room. Students are expected to listen and follow the Lecture. *<THE OFFICIAL ASSIGNED CLASSROOM>* can be a noisy room because of the large number of laptops/workstations and the server. Be considerate to your classmates and follow the Lecture. Do not use the computer (workstation) during lectures, and do not talk to your classmates during lectures. Do not open your laptops, or check email, web-chat, tweet, web-surf on the internet, and so forth. If you cannot follow these simple rules, please do not enroll in this class.

Lab Mode: This is when <BUILDING AND ROOM NUMBER>is used as a computer lab for in-class exercises, Canvas exams, and related assignments that involve the use of computers. Use the computers and share your ideas and solutions with your classmates except during exams or when otherwise instructed. For in-class exercises, the results of your work for that class session will need to be uploaded to an appropriate Canvas assignment for review and possible grading. We shall alternate between the two modes. A typical class will begin with a short lecture (Lecture Mode) to describe the in-class exercise that will reinforce the assignment. This will be followed by a hands-on (Lab Mode). There will be a number of in-class exercises or hands-on-exercises. The purpose of the in-class exercises and hands-on exercises is to develop your understanding of the course lectures, homework assignments, videos, and e-materials.

Grading Percentage Breakdown (NOTE: Ranges might change if point totals change)

Grading Percentage Breakdown		
Percent of Total Points	**Points**	**Letter Grade**
96.66%	≥ 967	A plus
93.33%	≥ 933	A
90.00%	≥ 900	A minus
86.66%	≥ 867	B plus
83.33%	≥ 833	B
80.00%	≥ 800	B minus
76.66%	≥ 767	C plus
73.33%	≥ 733	C
70.00%	≥ 700	C minus
66.66%	≥ 667	D plus
63.33%	≥ 633	D
60.00%	≥ 600	D minus
59.99%	< 600	F

HOW TO CALCULATE/ESTIMATE YOUR GRADE:
If students would like to calculate their numeric grade percentage, the formula is as follows: Numeric CS 123A Grade Percentage =

$$\frac{Total\ points\ from\ assignments}{Total\ course\ points} x\ 100\%$$

There is no guarantee that grades will be curved. If so, it will be done at the end of the semester. The instructor is already aware that graduate students need to maintain an overall GPA of B or better. Just because a student NEEDS a particular grade doesn't mean that the instructor will automatically GIVE the student that grade. Students must EARN a passing grade based on submitted and evaluated course work.

Extra credit options, if available:

There are no pre-planned extra credit assignments in this course. However, homework assignments and exams might, on occasion, contain extra credit options/questions. At times, the instructor might announce and give extra credit exercises or assignments in class or as work to be completed outside of classroom instruction. There is no guarantee that such extra credit exercises or assignments will be offered to the class. If, in the opinion of the instructor, offering such extra credit options will be significantly advantageous to the learning process, they might be offered.

Late Assignment Submission

Late assignments will receive a 25% point deduction of a graded assignment for each 24hr period after the submission deadline. For example, if an assignment is worth 10 points, and the grade for the assignment is 8/10, and the assignment is submitted one day late, then the point deduction equals 2.5, and the final grade for the assignment is MAX(0, 8 – 2.5) = MAX(0, 5.5) = 5.5 .

Missed Assignments, In-Class Exercises, Quizzes, and Exams

A. QUIZZES:
   a. The grade for one missed quiz will be replaced with the average of the remaining two quizzes. The average is calculated as the sum of current quiz grades / the number of quizzes for the semester. For example, if quiz 1 = 85, quiz 2 = 95, and quiz 3 is missed, the quiz 3 grade will be replaced by (85+95)/3 = 60.
   b. More than one missed quiz will result in a course grade of incomplete provided the total missed points for the semester is less than 20% of the total course points.
   c. Or, provide acceptable documentation of the reason for missing the quiz and a makeup quiz will be provided.

B. MIDTERM:
   a. The grade for a missed midterm exam will be 75% of the average score for quizzes, programming assignments, and homework assignments provided the total missed points for the semester is less than 20% of the total course points. Or, provide acceptable documentation of the reason for missing the midterm and a makeup exam will be provided.

C. HOMEWORK ASSIGNMENTS:
   a. The grade for one missed homework assignment will be replaced with the average of the remaining three homework assignments. The average is calculated as the sum of current homework grades / the number of homework assignments for the semester.
   b. The grade for the second missed homework assignments will be replaced with 75% of the average of the remaining homework assignments.
   c. More than two missed homework assignments will result in a grade of incomplete provided the total missed points for the semester is less than 20% of the total course points. An alternative is to accept zeros for the missed homework assignments, or if acceptable documentation of the reason for missing the homework assignments is provided, makeup assignments will be provided.

D. PROGRAMMING ASSIGNMENTS:
    a. The grade for one missed programming assignment will be replaced with 50% of the remaining programming assignment.
    b. Two missed programming assignments will result in a grade of incomplete provided the total missed points for the semester is less than 20% of the total course points. An alternative is to accept zeros for all missed programming assignments, or if acceptable documentation is provided, makeup assignments can be provided

E. IN-CLASS EXERCISES:
    a. The grade for one missed In-Class Exercise will be replaced with the average of the remaining three In-Class Exercises. The average is calculated as the sum of current in-class exercise grades / the number of in-class exercises for the semester.
    b. The grade for two missed In-Class Exercises will be replaced with 75% of the average of the remaining two In-Class Exercises.
    c. More than two missed In-Class Exercises will result in a grade of incomplete provided the total missed points for the semester is less than 20% of the total course points. An alternative is to accept zeros for all missed in-class exercises, or if acceptable documentation of the reason for missing the In-Class Exercises is provided, a makeup assignment can be provided.

F. WEEKLY FEEDBACK:
    a. All missed weekly feedback assignments will receive zero points.

G. FINAL PROJECT REPORT & CODE:
    a. The grade for a missed final project report and code will be 75% of the average of all other course assignments, exams, and quizzes provided the total missed points for all other assignments is less than 5% of the total course points.
    b. If the total missed points for all other assignments is more than 5% but less than 20% of the total course points, a grade of incomplete will be given.

H. TOTAL MISSED POINTS MORE THAN 20% BUT LESS THAN 30% OF TOTAL COURSE POINTS AND TOTAL MISSED POINTS MORE THAN 30%.
    a. **Missed between 20% and 30% of total course points:** A course grade that equal to (100% - <missed points %>) * Average of remaining assignments, quizzes, exams, and programming assignments.
    b. **Missed more than 30% of total course points:** If the percentage of total missed points is greater than 30%, a course grade that is the result of assigning a zero grade for all missed assignments will be assigned. An alternative grade or options can be discussed with the instructor.

Receiving An Incomplete (I) Grade

Receiving a grade of Incomplete (I) is not automatic. Students must complete at least 80% of course assignments by the end of the semester to be eligible to receive a grade of incomplete. Students must also provide documentation to support the reason for the request to receive an Incomplete grade. The instructor has the final decision to give an Incomplete grade. If the instructor agrees to give a student an Incomplete grade, the instructor will enter the remaining work to be completed as part of the PeopleSoft grade submission process.

Grade Change Policy:

It is a university policy (S09-7) that "A change of grade request must be submitted by the department office directly to the Office of the Registrar in a timely fashion. Normally, such requests must be received by the drop deadline of the following semester. Requests for exceptions to this policy must be accompanied with a documented and compelling reason."

University Policies:

Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. will be available on Office of Graduate and Undergraduate Programs' Syllabus Information web page at http://www.sjsu.edu/gup/syllabusinfo/. Make sure to review these policies and resources