San José State University
Computer Science Department
CS 123B Bioinformatics II, Sec 03, Spring 2025

Course and Contact Information

Instructor: Leonard Wesley

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Office Hours: Tuesdays 7:00AM – 9:00AM and by appointment via Zoom at the following link
https://sjsu.zoom.us/meeting/85152031440?occurrence=1738076400000&meetingMasterEventId=oblP9RmRRue3ddxxFv2p5A
PASSCODE: 168356

Class Days/Time: Tuesdays and Thursdays 4:30PM – 5:45PM

Classroom: Clark 111

Prerequisites: Prerequisite: CS 123A.

Official SJSU Catalogue 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.

Expanded Course Description

The course investigates the main algorithms for solving computational problems in bioinformatics related to proteins, DNA and RNA. Methods will include HMMs, sequence and structure alignment, and comparative structure analysis to identify and classify protein folds. Students will be given programming and/or web-portal projects that provide practice with using bioinformatics related tools and algorithms.

Learning Outcomes

Upon successful completion of this course, students will:

1. SLO-1 PROTEINS: Have a basic understanding of structural and molecular basis of proteins.   Become familiar with protein DBs and how they can be used to solve bioinformatics problems.
2. SLO-2 COMPUTATIONAL ALGORITHMS: Know how to design, build, and implement sequence identification, sequencing, and HMMs work,n7Uliar wiure a8sis3

Quizzes and Exams

There will be three quizzes, one midterm and a set of "topic final" projects, 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.

Projects

Topic final project topics will be described near the start of each topic in the course.

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:

Week 4	2/11	2/13	#1 Proteins	**2/11:** - Proteomics **2/13:** Module #1 - **In-Class Exercise 1** Topics Covered week 1 to week 4(9/8)	Learning Module #1
Week 5	2/18	2/20	#2 Comp Algorithms	**2/18:** - Comp Alg Context - Comp Alg Proj Description - Genetic Algorithms **2/20:** - Sequencing	Learning Module #2
Week 6	2/25	2]/27	#2 Comp Algorithms	**2/25:** - Sequencing - HMMs **2/27:** - **Quiz 1 (~35 mins): Covers Topics Week 1 thru Week 5** -	Learning Module #2
Week 7	3/4	3/6	#2 Comp Algorithms	**3/4:** - HMMs **3/6:** **In-Class Exercise 2 Topics Covered week 4 to week 6**	Learning Module #2
Week 8	3/11	3/13	#2 Comp Algorithms	**3/11:** - HMMs **3/13:** - HMMs - Functional Genomics Context	Learning Module #2

Week					
Week 9	3/18	3/20	#3 Functional Genomics	**3/18:** - Functional Genomics Project Description - Functional Genomics (FG) **3/20:** - **Midterm (Full period): Covers Topics Week 1 thru Week 8** - Model organisms for FG Bacteria, Yeast, …, Homo sapiens	Learning Module #3
Week 10	3/25	3/27	#3 Functional Genomics	**3/25:** - FG: Forward & Backward **3/27:** - FG: Forward & Backward	Learning Module #3
	3/31	**4/4**		**SPRING BREAK**	
Week 11	4/8	4/10	#3 Functional Genomics	**4/8:** **In-Class Exercise 3 Covers Topics In Class Exercise 1 thru Week 6** **4/10:** - FG: DNA & Proteins	Learning Module #3
Week 12	4/15	4/17	#3 Functional Genomics	**4/15:** - Finish HMM - Start Functional Genomics & Protein Networks **4/17:** **Quiz 2 (~45 mins): Covers Topics Week 5 thru Week 11**	Learning Module #3

Week					
Week 13	4/22	4/24	#4 Pharmacology & Drug Development	**4/22:** - Functional Genomics & Protein Networks **4/24:** - Functional Genomics & Protein networks	Learning Module #4
Week 14	4/29	4/22	#4 Pharmacology & Drug Development	**4/29:** - Functional Genomics & Protein Networks **4/22:** - The drug development process - The theory and practice of pharmacology & drug development	Learning Module #4
Week 15	5/6	5/8	#4 Pharmacology & Drug Development	**5/6:** **In-Class Exercise 4** - (Work on Last Topic Project) **5/8:** **Quiz 3 (~45 mins): Covers From Week 11 thru Week 14**	Learning Module #4
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			Final Project Report and Code Due To Canvas Wednesday May 14, 2025 By 11:59PM **No Final Exam.** **The Project Takes The Place Of The Final Exam**		

SCHEDULE FOOTNOTES:
NONE AS OF SPRING 2025

Grades *
WRITTEN HOMEWORK (4 at 25 points each)	100 pts
QUIZZES (3 at 50pts each)	150 pts
MIDTERM	100 pts
IN-CLASS EXERCISES (4 at 50pts each)	200 pts
WEEKLY COURSE FEEDBACK (15 at 3.33pts each)	50 pts
TOPIC PROJECTS & CODE (4 at 50pts each)	200 pts

Total Course Points $\qquad$ = 800 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, the above point distribution by ± 5 pts. Such adjustments might be based on the difficulty or simplicity of assignments or quizzes or exams.

Grading Percentage Breakdown

Percent of Total Points	Points	Letter Grade
96.66%	773	A+
93.33%	747	A
90.00%	720	A-
86.66%	693	B+
83.33%	667	B
80.00%	640	B-
76.66%	613	C+
73.33%	587	C
70.00%	560	C-
66.66%	533	

Extra Credit Options

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 the availability of extra exercises or assignments. 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 the submission is late. 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 grade of incomplete provided the total missed points for the semester is less than 20% of the total course points.

    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 as described in version 1 of this course syllabus 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 two 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. **<u>Missed between 20% and 30% of total course points:</u>** A course grade