

**San José State University
Computer Science Department
CS 223 Bioinformatics, Sec 01, Fall 2022**

Course Information

Instructor: Leonard Wesley

Office Location: MH 212

Telephone: 408.924.5287 (Office, however, I will not be on campus much during the Fall 2022 semester.)

Email: Leonard.Wesley@sjsu.edu

Office Hours: Tuesdays 6:30AM – 8:30AM,
Zoom Link For Office Hours For Fall 2022::
<https://sjsu.zoom.us/j/81579190359?pwd=RIMwUGduVy9rSUFMeVZnU2YyMTdlZz09>
Passcode 355621

Class Days/Time: Section 01: Tuesdays and Thursdays 3:00PM – 4:15AM

Classroom: MH 422

Prerequisites: CS/BIOL/SE 123B. Allowed Declared Major:

Official SJSU Catalogue Course Description

The course investigates the main algorithms for solving computational problems in bioinformatics. Methods will include Hidden Markov Models for gene prediction and protein profiling, and Genetic Algorithms for biological sequence analysis and structure prediction. Students will be given programming projects.

Expanded Course Description

The course presents some of the methods and techniques of algorithm analysis that can be used to assess time and space complexity of several algorithms that are used in bioinformatics. At times, vast amounts of data must be analyzed and interpreted to help answer bioinformatic related problems and questions. Computational pipelines and workflows are frequently needed to process large datasets in a timely and accurate manner. Knowing how to assess time and space performance of algorithms, and knowing how to design and implement efficient algorithms for pipelines/workflows can, at times, be a requirement to address questions of interest. Example algorithms that will be investigated include Principal Component Analysis (PCA), Singular Value Decomposition (SVD) if time permits, advanced Hidden Markov Models for gene prediction or protein profiling, biological sequence analysis, and structure prediction. Students will be given programming projects that provide practice with analyzing, designing, implementing, and using bioinformatics related algorithms.

Learning Outcomes

Last Updated August 2022

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structures will have equivalent workload expectations as described in the Syllabus/Syllabus.

Quizzes and Exams

There will be three quizzes, one midterm and three “topic-projects” that will replace a final exam all of which will count toward a student’s final grade as specified in the “Grades” section below. During quizzes

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.

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 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	8/23	8/25	#1 Computational Analytics (MSBI Majors)	8/23: Intro To Course: -Topics, learning objectives, course logistics, Instructor background - Syllabus	Learning Module #1
			#1 Biology Basics (MSCS Majors)	8/25: - Analyzing algorithms (MSBI) - Biology Central Dogma (MSCS)	

Week
2 8/30 9/1

Week 5	9/20	9/22	#2 PCA, SVD	<p>9/20:</p> <ul style="list-style-type: none"> - PCA - Strassen matrix multiplication <p>9/22: Module #1 In-Class Exercise 1</p> <ul style="list-style-type: none"> - Covers topics in Week1 thru Week 4 	Learning Module #2
Week 6	9/27	9/29	#2 PCA, SVD	<p>9/27:</p> <ul style="list-style-type: none"> - PCA, time & space complexity comparison and analysis. <p>9/29: Quiz 1 (~35 mins): Covers Topics Week 1 thru Week 5</p>	Learning Module #2
Week 7	10/4	10/6	#3 Advanced HMMs	<p>10/4:</p> <ul style="list-style-type: none"> - Advanced HMMs - Analysis of HMMs <p>10/6: In-Class Exercise 2 Covers topics in Week 4 thru 6</p>	Learning Module #3
Week 8	10/11	10/13	#3 Advanced HMMs	<p>10/11:</p> <ul style="list-style-type: none"> - Analysis of HMMs - Evidential Reasoning <p>10/13:</p> <ul style="list-style-type: none"> - Evidential Reasoning and HMMs 	Learning Module #3

Week 9	10/18	10/20	#3 Advanced HMMs	10/18: <ul style="list-style-type: none"> - Evidential Reasoning and HMMs 10/20: Midterm (Full period): Covers Topics Week 1 thru Week 7	Learning Module #3
Week 10	10/25	10/27	#3 Advanced HMMs	10/25: <ul style="list-style-type: none"> - Evidential Reasoning and HMMs 10/27: <ul style="list-style-type: none"> - Finish Evidential Reasoning and HMMs 	Learning Module #3
Week 11	11/1	11/3	#4 Pattern Analysis	11/1: <ul style="list-style-type: none"> - Intro Pattern Analysis 11/3: <ul style="list-style-type: none"> - Pattern Analysis Profiles 	Learning Module #4
Week 12	11/8	11/10	#4 Pattern Analysis	11/8: In-Class Exercise 3 Topics Coverd Week 8 to Week 11 11/10: Quiz 2 (~40 mins): Covers Topics Week 8 thru Week 12	Learning Module #4
Week 13	11/15	11/17	#4 Pattern Analysis	11/15: <ul style="list-style-type: none"> - Pattern Analysis Moifs 11/17:	Learning Module #4

Week 14	11/22	11/24	#4 Pattern Analysis	11/22: - Pattern Analysis Gene Expression 11/24: THANKSGIVING	Learning Module #4
Week 15	11/29	12/1	#4 Pattern Analysis	11/29: - Pattern Analysis motifs 12/1: In-Class Exercise 4 (work on Topic Project)	Learning Module #4
Week 16	12/6	N/A	#4 Pattern Analysis	12/6: Quiz 3 (~35 mins): Covers Topics Week 9 thru Week 13	Learning Module #4
			Final Project Report and Code Due To Canvas Wednesday December 14, 2022 By 11:59PM		

SCHEDULE FOOTNOTES:

NONE AS OF AUGUST 2022

Grades *

WRITTEN HOMEWORK (3 at 10 points each)	30 pts
PROGRAMMING ASSIGNMENTS (4 at 50 points each)	200 pts
QUIZZES (3 at 50pts each)	150 pts
MIDTERM	100 pts
IN-CLASS EXERCISES (4 at 50pts each)	200 pts
WEEKLY COURSE FEEDBACK (14 at 5pts each)	70 pts
PROJECT REPORT & CODE (200pts)	200 pts

 Total Course Points = 1,050 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%	1015	A plus
93.33%	980	A
90.00%	945	A minus
86.66%	910	B plus
83.33%	875	B
80.00%	840	B minus
76.66%	805	C plus
73.33%	770	C
70.00%	735	C minus
66.66%	700	D plus
63.33%	665	D
60.00%	630	D minus
59.99%	630	F

(NOTE: Ranges might change if point totals change)

How To Calculate/Estimate Your Grade

If students would like to calculate their numeric grade percentage, the formula is as follows:

Numeric Grade Percentage =

$$\frac{\sum \text{Points Earned}}{\text{Total Points}} \times 100\%$$

There is no guarantee that grades will be curved. If so, it will typically 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 in

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 Spring or Fall 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.