San José State University
Computer Science Department
CS/BIOL 123A Bioinformatics I, Sec 01 & Sec 02, Fall 2022

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 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=RlMwUGduVy9rSUFMeVZnU2YyMTdIZz09 Passcode 355621
Class Days/Time:	Section 01: Tuesdays and Thursdays 9:00AM – 10:15AM Section 02: Tuesdays and Thursdays 10:30AM –11:45AM
Classroom:	MH 422. Both sections.
Prerequisites:	BIOL 30 and BIOL 31, or CS 46A and CS 46B

CoS COVID-19 and Monkeypox:

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).

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 that describes the general organization and procedure all students are to follow for all in-class exercise assignments. The "In-Class Exercise Procedure.pdf" document should be treated as part of the Syllabus for this course.

Reading, Homework, Programming, Participation Assignments

Graded reading, homework, programming, class participation and brief course feedback assignments will be given almost weekly. For homework assignments, only one or two questions will be graded. However, answers for all questions will be provided no sooner than four (4) days after the due date. For non-programmer types (e.g., Biology. Biochem, … 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,… 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 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 Biology Basics	8/23 Intro To Course: -Topics, learning objectives, course logistics, Instructor background - Syllabus 8/25 Intro to molecular cell biology, DNA, RNA, and the central dogma. - DNA Replication, Transcription, and Translation	Learning Module #1
Week 2	8/30	9/1	#1 Biology Basics	8/30: DNA Replication, Transcription, Translation, Proteins 9/1: - NCBI Gene, Protein, and Nucleotide DBs	Learning Module #1

Week 3	9/6	9/8	#2 Bioinformatics DBs	9/6: - NCBI Gene, Protein, and Nucleotide DBs 9/8: - Possible Projects - Entrez DB - Ensembl DB	Learning Module #2
Week 4	9/13	9/15	#2 Bioinformatics DBs	9/13: - Entrez DB - Ensembl DB 9/15: **In-Class Exercise 1 Covers topics in Week1 thru Week 4**	Learning Module #2 The new deadline for students to Add or Drop classes via MySJSU with no petition is September 15 (per University Policy S22-6)
Week 5	9/20	9/22	#2 Bioinformatics DBs	9/20: - Ensembl DB - UCSC Genomic DB 9/22: - UCSC Genomic DB	Learning Module #2 Project Proposals Due Wed 9/21
Week 6	9/27	9/29	#3 Alignment	9/27: - Pairwise Alignment 9/29: - **Quiz 1 (~40 mins): Covers Topics Week 1 thru Week 5**	Learning Module #3
Week 7	10/4	10/6	#3 Alignment	10/4: - Pairwise Alignment 10/6: **In-Class Exercise 2 Covers topics in Week 4 thru 6**	Learning Module #3

Week 8	10/11	10/13	#3 Alignment	10/11: - Pairwise Alignment 10/13: - Multiple Sequence Alignment	Learning Module #3
Week 9	10/18	10/20	#4 Phylogeny	10/18: - Multiple Sequence Alignment 10/20: **Midterm (Full period): Covers Topics Week 1 thru Week 8**	Learning Module #4
Week 10	10/25	10/27	#4 Phylogeny	10/25: - Multiple Sequence Alignment - Molecular phylogenetic Trees 10/27: - Molecular phylogenetic Trees	Learning Module #4
Week 11	11/1	11/3	#4 Phylogeny	11/1: - Multiple Sequence Alignment - Molecular phylogenetic Trees 11/3: - Molecular phylogenetic Trees	Learning Module #4

Week 12	11/8	11/10	#4 Phylogeny	11/8: **In-Class Exercise 3 Topics Covered Week 6 to Week 10** 11/10: **Quiz 2 (~40 mins): Covers Topics Week 5 thru Week 10** Molecular Phylogenetic Trees	Learning Module #4
Week 13	11/15	11/17	#4 Phylogeny & #5 Bioinformatic Frontiers	11/15: - Molecular Phylogenetic Trees 11/17: - CRISPR-CAS9	Learning Module #4 & Learning Module #5
Week 14	11/22	11/24	#5 Bioinformatic Frontiers	11/15: - CRISPR-CAS9 cont. 11/17 **THANKSGIVING**	Learning Module #5
Week 15	11/29	12/1	#5 Bioinformatic Frontiers	11/29: - CRISPR-CAS9 cont. 12/1: **In-Class Exercise 4** (Work on Projects, Q&A)	Learning Module #5
Week 16	12/6	N/A	#5 Bioinformatic Frontiers	12/6: **Quiz 3: Covers Topics Week 9 thru Week 15**	Learning Module #5
				Final Project Report and Code Due To Canvas **Wednesday December 14, 2022 By 11:59PM**	

NONE AS OF FALL 2022

Grades *

WRITTEN HOMEWORK (4 at 20 pts each)	80 pts
QUIZZES (3 at 50pts each)	150 pts
MIDTERM	200 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   = 1,100 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%	≥	1063	A plus
93.33%	≥	1027	A
90.00%	≥	990	A minus
86.66%	≥	953	B plus
83.33%	≥	917	B
80.00%	≥	880	B minus
76.66%	≥	843	C plus
73.33%	≥	807	C
70.00%	≥	770	C minus
66.66%	≥	733	D plus
63.33%	≥	697	D
60.00%	≥	660	D minus
59.99%	<	660	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 =

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

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 .

Making Up Missed Assignments

An opportunity to makeup missed exams, homework, in-class exercises, programming assignments, and so forth will be provided if and only if verifiable documentation of a compelling reason (e.g., illness, COVID-19 infection, accident, death in the immediate family, work related) for missing the assignment is provided within one week from the student's ability to return to class. It is the student's responsibility to (1) contact the instructor if an assignment has or will be missed; (2) obtain verification from the instructor that the student will be allowed to make up the assignment, subject to acceptable and verified documentation; and (3) make arrangements with the instructor to submit all missing assignments by the sooner of a date specified by the instructor or by the end of the semester, whichever is earlier. Failure to provide verifiable documentation of the reason for missing the assignment or failure to provided such within one week from the student's ability to return to class will result in not being able to make up the missed assignment.

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 Fall 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