San José State University
Computer Science Department
BIOL/CS/SE 123A: BIOINFORMATICS I
Section 01, Spring 2020

Course and Contact Information

Instructor:	Zach Tom
Office Location:	Duncan Hall 282
Email:	zachptom@gmail.com
Office Hours:	MW 12:00 pm – 1:00 pm
Class Days/Time:	MW 10:30 am – 11:45 am
Classroom:	Science Building 311
Prerequisites:	Biol 30 and Biol 31, or CS 46A and CS 46B

Course Format

- Class time will be spent either in "lecture" mode or in "lab" mode, explained in "Class Protocol".
- You are required to bring your wireless laptop to each class.
- Exams will be in-class, hand-written, closed-book.
- Course materials such as syllabus, handouts, notes, hands-on exercise, project instructions, etc. can be found on Canvas Learning Management System course login website at https://sjsu.instructure.com. You are responsible for regularly checking with the Canvas messaging system to learn of any updates.

Course Description

Introduction to the main public domain tools, databases and methods in bioinformatics. Analysis of algorithms behind the most successful tools, such as 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.

Course Learning Outcomes (CLO)

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, and the dynamic programming algorithms that compute them.
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.

Required Texts/Readings

Textbook

"Understanding Bioinformatics" by Marketa Zvelebil and Jeremy Baum, 1st edition, Garland Science, 2008, ISBN 0-815-34024-9.

Other Readings

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

Course Requirements and Assignments

1. **Hands-On Classwork (5%):** Eleven hands-on assignments. 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 students put effort into them.
2. **Problem Sets (20%):** Four homework assignments. The purpose of the assignments is to develop your understanding of the material and your skills in problem-solving. Homework is only accepted in hardcopy. Only a subset of the assigned problems on any given problem set will be graded. Assignments are due at the beginning of the lecture on the following dates:
    - Monday, February 10, 2020: Homework 1
    - Monday, February 24, 2020: Homework 2
    - Wednesday, March 18, 2020: Homework 3
    - Monday, April 13, 2020. Homework 4
3. **Term-Project (20%):** Information on the term project can be found in the course website in Canvas. It is a group project. Each group consists of two students. Here are the key deliverables and due dates:
    a) Team Formation: Wednesday, February 26, 2020.
    b) Project proposal: Wednesday, March 11, 2020.
    c) Progress Report: Monday, April 6, 2020.
    d) Final Project: Wednesday, May 6, 2020.
    e) Presentation: Each group gives a 10-minute, in-class presentation on May 6 or May 11, 2019, during class time.
4. **Term Exams (30%):**

    Exam One (15%): Monday, March 9, 2020.

    Exam Two (15%): Monday, April 20, 2020.

    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 on the exams as well.
5. **Final Exam (25%):** A cumulative Final Exam will be given on Friday, May 15, 2020, from 10:45 am to 12:00 pm. If there is a time conflict, please inform the instructor at least two weeks in advance for rescheduling.

"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."

Grading Information

Except for the final course grade which is posted on MySJSU, all other grades (assignments, projects, exams) are posted on Canvas.

Grading calculation will be based on the following:

- Eleven Hands-on Assignments (5%)
- Four Assignments/Problem Sets (20%)
- 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+	72.0 – 76.99	C
93.0 – 96.99	A	70.0 – 71.99	C-
90.0 – 92.99	A-	67.0 – 69.99	D+
87.0 – 89.99	B+	62.0 – 66.99	D
82.0 – 86.99	B	60.0 – 61.99	D-
80.0 – 81.99	B-	<60.0	F
77.0 – 79.99	C+		

No Extra Credit Assignments will be given.

Classroom Protocol

- **Dual Role of SCI 311:** Lecture/Lab SCI 311 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:** This is when SCI 311 is used as a regular lecture room. Students are expected to listen and follow the lecture. Be considerate to your classmates and follow the lecture. Do not use the computer and/or talk to your neighbor.
- **Lab Mode:** This is when SCI 311 is used as a computer lab. Use the computers. Work collaboratively on problems of the Hands-On 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 to class on-time so that you benefit fully from the course experience and you do not disturb classmates and 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.

University Policies

Per University Policy S16-9 *(http://www.sjsu.edu/senate/docs/S16-9.pdf)*, relevant information to all courses, such as academic integrity, accommodations, dropping and adding, consent for recording of class, etc. is available on Office of Graduate and Undergraduate Programs' Syllabus Information web page at http://www.sjsu.edu/gup/syllabusinfo/". Make sure to visit this page, review and be familiar with these university policies and resources.

Biology/CS123A Bioinformatics I, Section 01, Spring 2020 Course Schedule

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

Course Schedule

Week	Date	Topics
1	1/27	Syllabus. Introductions. Course Expectations. Bioinformatics: historical development, current challenges. *Hands-On #1*
1	1/29	Background: Molecular biology. *Hands-On #2*
2	2/3	Background: Molecular biology. *Hands-On #2*
2	2/5	Background: Molecular biology and Bioinformatics Databases. *Hands-On #3*
3	2/10	**Homework #1 due.** Bioinformatics Databases. *Hands-On #3*
3	2/12	Homework #1 answers. Pairwise alignment. *Hands-On #4*
4	2/17	Pairwise sequence alignment. *Hands-On #5 (Professor Wendy Lee Lecture)*
4	2/19	Pairwise sequence alignment. *Hands-On #5*
5	2/24	**Homework #2 due**. Pairwise sequence alignment. *Hands-On #6*
5	2/26	Homework #2 answers. **Project team formation due**. Multiple sequence alignment.
6	3/2	Multiple sequence alignment. *Hands-On #6*
6	3/4	Multiple sequence alignment. *Hands-On #7.* Review.
7	3/9	**Term Exam #1**
7	3/11	Multiple sequence alignment. **Project Proposal Due**.
8	3/16	Exam #1 answers.
8	3/18	**Homework #3 due**. Phylogenetic inference. *Hands-On #8*
9	3/23	Homework #3 answers. Phylogenetic inference. *Hands-On #8*
9	3/25	Phylogenetic inference. *Hands-On #9*
10	3/30	**Spring Recess - no classes**
10	4/1	**Spring Recess - no classes**
11	4/6	**Project Progress Report due**. Phylogenetic inference. *Hands-On #10*
11	4/8	Phylogenetic inference. *Hands-On #10*
12	4/13	**Homework #4 due**. Sequence Motifs. *Hands-On #11*
12	4/15	Homework #4 answers. Review.
13	4/20	**Term Exam #2**
13	4/22	Sequence Motifs. *Hands-On #11*
14	4/27	Exam #2 answers.
14	4/29	Next Generation Sequencing
15	5/4	Next Generation Sequencing
15	5/6	**Final Project due**. Project presentations
16	5/11	Project presentations
16	5/15	**Final Exam. Friday 10:45 am – 12:00 pm**