

# CS 123A: BIOINFORMATICS I

*San José State University*

*Computer Science Department*

Section 02, Fall 2018

## COURSE AND CONTACT INFORMATION

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**Instructor:** Wendy Lee Ph.D.  
**Office Location:** Duncan Hall 282 (DH 282)  
**Email:** wendy.lee@sjsu.edu  
**Office Hours:** Wednesday 9:30 am – 10:30 am  
**Class Days/Time:** Monday & Wednesday 10:30 am – 11:45 am  
**Classroom:** Duncan Hall 450 (DH 450)  
**Prerequisites:** Biol 30 and Biol 31, or CS 46A and CS 46B

## COURSE FORMAT

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- Class time will be spent either in “lecture” mode or in “lab” mode, explained in “Class Protocol” in this document.
- 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

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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 OUTCOME (CLO)

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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

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**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

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1. **Problem Sets (25%):** Five 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. 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. Any homework not picked up during class time will be left on the shelves near my office door. Assignments are due in the beginning of the lecture on the following dates:
  - Monday September 10, 2018: Homework 1
  - Monday, October 1, 2018: Homework 2
  - Monday, October 15, 2018: Homework 3

- Monday, November 5, 2018. Homework 4
  - Monday November 19, 2018. Homework 5
2. **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:
- a. **Team Formation:** due on Wednesday, September 26, 2018.
  - b. **Project proposal:** due on Monday, October 8, 2018.
  - c. **Progress Report:** is due on Monday, October 29, 2018.
  - d. **Final Project:** is due on Monday, December 3 2018.
  - e. **Presentation:** Each group gives a 20-minute, in-class presentation (10 minutes per student) on December 3 or 5, 2018, during class time.
3. **Term Exams (30%):**
- Exam One (15%):** Wednesday, October 10, 2018.  
**Exam Two (15%):** Wednesday, November 14, 2018.  
 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.
4. **Final Exam (25%):** A cumulative Final Exam will be given on Tuesday, December 18, 2018, from 9:45 am to 12:00 pm.

## GRADING INFORMATION

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**Grading calculation will be based on the following:**

- Five Assignments/Problem Sets (25%)
- 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:** Assignments submitted after their specified due date and time will be deducted 20% total points for the assignment for each day past the due date/time.

**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**

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- **Dual Role of DH450:** Lecture/Lab DH450 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 DH450 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 DH450 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

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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/>

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## COURSE SCHEDULE

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

Week	Date	Topics
1	8/22	Green Sheet. Introductions. Course Expectations. Bioinformatics: historical development, current challenges. <i>Hands-On #1</i>
2	8/27	Background: Molecular biology. <i>Hands-On #2</i>
2	8/29	Background: Molecular biology. <i>Hands-On #2</i>
3	9/3	Labor Day – No Class
3	9/5	Background: Molecular biology and Bioinformatics Databases. <i>Hands-On #3</i>
4	9/10	Homework #1 due. Bioinformatics Databases. <i>Hands-On #3</i>
4	9/12	Homework #1 answers. Pairwise alignment. <i>Hands-On #4</i>
5	9/17	Pairwise sequence alignment. <i>Hands-On #5</i>
5	9/19	Pairwise sequence alignment. <i>Hands-On #5</i>
6	9/24	<b>Homework #2 due.</b> Pairwise sequence alignment. <i>Hands-On #6</i>
6	9/26	Homework #2 answers. Project team formation due. Multiple sequence alignment. <i>Hands-On #6</i>
7	10/1	Multiple sequence alignment. <i>Hands-On #7</i>
7	10/3	Multiple sequence alignment. <i>Hands-On #7</i>
8	10/8	Multiple sequence alignment. <b>Project Proposal Due.</b> <i>Hands-On #8.</i> Review.
8	10/10	<b>Term Exam #1</b>
9	10/15	<b>Homework #3 due.</b> Multiple sequence alignment
9	10/17	Homework #3 answers. Phylogenetic inference. <i>Hands-On #9</i>
10	10/22	Phylogenetic inference. <i>Hands-On #10</i>
10	10/24	Phylogenetic inference. <i>Hands-On #11</i>
11	10/29	<b>Project Progress Report due.</b> Phylogenetic inference. <i>Hands-On #12</i>
11	10/31	Sequence Motifs. <i>Hands-On #13</i>
12	11/5	<b>Homework #4 due.</b> Sequence Motifs. <i>Hands-On #13</i>
12	11/7	Homework #4 answers. Sequence Motifs. <i>Hands-On #14.</i> Review
13	11/12	Veterans Day – No Class
13	11/14	<b>Term Exam #2</b>
14	11/19	<b>Homework #5 due.</b> Exam #2 answers. Next Generation Sequencing

<b>Week</b>	<b>Date</b>	<b>Topics</b>
14	11/21	Homework #5 answers. Next Generation Sequencing
15	11/26	Thanksgiving Day – No Class
15	11/28	Next Generation Sequencing
16	12/3	<b>Final Project due.</b> Project presentations
16	12/5	Project presentations
17	12/10	Review
18	12/18	<b>Final Exam. Tuesday 9:45 am to 12:00 pm</b>

**Important dates:**

**8/31/2018:** Last day to Drop a Class without a "W" grade.

**9/10/2018:** Last day to Add via MySJSU online without a Petition & Late fee

**11/16/2018:** Last day to Withdraw.