

San José State University
Computer Science Department
Computer Science / Biology 123B: Bioinformatics II, Spring 2018

Course and Contact Information

Instructor:	Philip Heller
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Office Hours:	Wednesdays 2:30-3:30, or by appointment
Class Days/Time:	M/W 12:00 – 1:15
Classroom:	SCI 311
Prerequisite:	CS/BIOL 123A

Course Format

Some class meetings, to be announced in advance, will be software labs. Students are required to bring a wifi-enabled computer to these sessions.

Course Description (Required)

Catalog description: Computational methods used for searching, classifying, analyzing, and modeling protein sequences. Tools for analyzing DNA and RNA sequences. More advanced topics, such as genetic algorithms and simulated annealing, which can be used to address folding problems.

This section will emphasize sequencing technology, Hidden Markov Models, Conserved Domains, the ARBitrator algorithm, expression analysis pipelines, and applications to space exploration.

Course Learning Outcomes (CLO)

Upon successful completion of this course, students will be able to:

1. Describe technology for amplifying, sequencing, and assembling nucleic acids.
2. Describe Markov Chains and Hidden Markov Models, understand the related algorithms, and be able to create Hidden Markov Models for identifying nucleotide and amino acid sequences.
3. Understand and apply techniques for mining large sequence databases.
4. Analyze differential expression data.

Required Texts/Readings

Textbook

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

Other technology requirements / equipment / material

Homework assignments, class project, and some class sessions require a wifi-capable computer.

Course Requirements and Assignments

Homework Assignments: There will be approximately 6 homework assignments. No late homework will be accepted except by prior (before deadline) arrangement with the instructor or in cases of documented emergency. Homework is due at the start of class on the due date.

Term Project: Students will do a term project in teams of 2. Students in CS 123A must do a project that includes programming, in the language of their choice. Students in Biology 123A may do the same, or may do a project involving acquiring published data and then analyzing the data using 3rd-party bioinformatics tools.

Exams: Two in-class midterm exams (15% each) and one final exam (20%). Missed exams cannot be made up except for reasons of illness as certified by a doctor, or documentable extreme emergency. Makeup exams may be oral.

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.

Final Examination or Evaluation: There will be a final examination on Tuesday May 19 at 9:45 AM.

Grading Information

Determination of Grades

Homework: 25%

Midterm 1: 15%

Midterm 2: 15%

Project: 25%

Final: 20%

At least	Letter Grade
97%	A+
93%	A
90%	A-
87%	B+
83%	B
80%	B-
77%	C+
72%	C
70%	C-
67%	D+
62%	D
60%	D-
<60%	F

Academic Honesty and Expected Behavior

Students are expected to be honest and respectful at all times. Disruption and cheating are not tolerated.

Disruption includes using electronics at any time during any lecture, except to enhance learning of the course material. The first time a student is disruptive, their final grade will be reduced by 1/3 of a point (e.g. B- becomes C+). The second time, their final grade will be reduced by an entire point (e.g. C+ becomes D+). The third time, the student will receive an F in the course. All incidents of disruption will be reported to the university, which may impose further sanctions.

Cheating includes submitting a homework assignment that is not 100% your own work, allowing another student to copy your homework, and giving/receiving information of any kind during an exam. The first time a student is caught cheating, they will receive zero points on the homework or exam, and will have their final grade reduced by 2 points (e.g. A- becomes C-). The second time, they will receive an F in the course. All incidents of cheating will be reported to the university, which may impose further sanctions.

University Policies (Required)

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/>

CS/BIOL 123B Spring 2020 Course Schedule

This agenda is approximate.

Course Schedule

Week	Date	Topics, Readings, Assignments, Deadlines
1	1/27	Intro to course. History of Bioinformatics.
1	1/29	Markov Models.
2	2/3	Hidden Markov Models.
2	2/5	Hidden Markov Models.
3	2/10	Hidden Markov Models.
3	2/12	Profile Hidden Markov Models.
4	2/17	Profile Hidden Markov Models.
4	2/19	Amplification and sequencing.
5	2/24	Amplification and sequencing.
5	2/26	Amplification and sequencing.
6	3/2	Review for Midterm 1.
6	3/4	Midterm 1.
7	3/9	Midterm 1 answers. Conserved domains.
7	3/11	Conserved domains, ARBitrator, CO-ARBitrator.
8	3/16	Deep Learning and Bioinformatics: Poriferal Vision and Coral Vision
8	3/18	Metagenomics.
9	3/23	Metagenomics.
9	3/25	Bioinformatics of space exploration. Differential expression.
10	3/30	Spring Break
10	4/1	Spring Break
11	4/6	Bioinformatics of space exploration. Differential expression. The NASA pipeline.
11	4/8	Bioinformatics of space exploration. Differential expression. The NASA pipeline.
12	4/13	Review for Midterm 2.
12	4/15	Midterm 2
13	4/20	Midterm 2 answers. The NASA pipeline.

Week	Date	Topics, Readings, Assignments, Deadlines
13	4/22	The NASA pipeline.
14	4/27	Project presentations.
14	4/29	Project presentations.
15	5/4	Project presentations.
15	5/6	Project presentations.
16	5/11	Review for final exam.
Final Exam	5/19 (Tues)	9:45 AM SCI 311