San José State University

Computer Science Department
Computer Science / Biology 123B: Bioinformatics II, Section 1, Spring 2018

Course and Contact Information

Instructor:	Philip Heller
Office Location:	MacQuarrie Hall 211
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Office Hours:	Thursdays 9:30-11:30
Class Days/Time:	M/W 10:30 – 11:45
Classroom:	Duncan Hall 450
Prerequisites:	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

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, Profile Hidden Markov Models, Conserved Domains, the ARBitrator algorithm, and metagenomics.

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. Perform metagenomic analysis.

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. Homework is only accepted in hardcopy. No late homework will be accepted except by prior arrangement with the instructor or in cases of documented emergency. Homework is due at the end of class on the due date.

Term Project: Students will do a term project in teams of 1 or 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 (25%). 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 Wednesday May 15 at 9:45 AM.

Grading Information

Determination of Grades

Homework: 25%
Midterm 1: 15%
Midterm 2: 15%
Project: 20%
Final: 25%

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

Classroom Protocol

Students are expected to arrive on time and to be attentive and respectful. Use of any electronic device for any purpose not related to the course material is not allowed.

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 2019 Course Schedule

This agenda is approximate. Topics and exam dates will be announced

Course Schedule

Week	Date	Topics, Readings, Assignments, Deadlines
1	1/28	Intro to course. Amplification and sequencing.
1	1/30	Amplification and sequencing.
2	2/4	Amplification and sequencing.
2	2/6	Amplification, sequencing, and sequence assembly.
3	2/11	Markov Models.
3	2/13	Hidden Markov Models.
4	2/18	Hidden Markov Models.
4	2/20	Hidden Markov Models.
5	2/25	Hidden Markov Models.
5	2/27	Guest speaker.
6	3/4	Review for Midterm 1.
6	3/6	Midterm 1.
7	3/11	Midterm 1 answers. Profile HMMs.
7	3/13	Profile HMMs.
8	3/18	Profile HMMs.
8	3/20	Conserved domains, ARBitrator, CO-ARBitrator
9	3/25	The Bioinformatics of Space Travel
9	3/27	Metagenomics
10	4/1	Spring Break
10	4/3	Spring Break
11	4/8	Guest speaker
11	4/11	Deep Learning Bioinformatics.
12	4/15	Review for Midterm 2.
12	4/17	Midterm 2
13	4/22	Project presentations.

Week	Date	Topics, Readings, Assignments, Deadlines
13	4/24	Project presentations.
14	4/29	Project presentations.
14	5/1	Project presentations.
15	5/6	Project presentations.
15	5/8	Project presentations.
16	5/13	Review for final exam.
Final Exam	5/15	9:45 AM Duncan Hall 450