

BIOL/CS123B: BIOINFORMATICS II

Section 01, Fall 2021

San José State University

Department of Computer Science

COURSE & CONTACT INFORMATION

- **Instructor:** Wendy Lee Ph.D.
- **Email:** wendy.lee@sjsu.edu
- **Class Days/Time:** Tue & Thu 12:30 pm – 1:45 pm (Pacific Standard Time)
- **Office Hours:** Schedule appointment @ www.sjsu.edu/people/wendy.lee/
Wed 10:00 am – 11:00 am, Fri 8:00 am - 9:00 am
- **Classroom:** Online via Zoom (Zoom link is posted on Canvas)
- **Prerequisites:** BIOL/CS123A

COURSE FORMAT

- This course will be conducted in an online mode: Lectures and Labs will take place during live Zoom meetings. Zoom lectures will be recorded and posted in the Canvas Learning Management System at <https://sjsu.instructure.com>.
- Class time (live session) will be spent either in “lecture” mode or in “lab” mode, explained in “Class Protocol” in this document.
- Course materials such as syllabus, handouts, notes, hands-on exercises, projects, quizzes, exams, etc. can be found on Canvas Learning Management System. You are responsible for regularly checking with the Canvas messaging system to learn of any updates.
- Written and oral assessments will be used to measure student learning in this course.

COURSE 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 on sequencing technologies, DNA variant calling, gene-expression analysis, metagenomics analysis, and bioinformatics pipeline development.

COURSE LEARNING OUTCOME (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. Genome sequencing technologies and applications.
2. Obtain publicly available sequencing data from NCBI SRA database.
3. Pre-processing raw sequencing reads and aligning them to a reference genome.
4. DNA variant calling for genotyping and cancer/disease detection.
5. Differential gene expression analysis using RNA-seq.
6. Metagenomics analysis using 16S and shotgun sequencing.
7. Bioinformatics analytical pipeline development.

COURSE REQUIREMENTS AND ASSIGNMENTS

- **Quizzes (10%):** Quizzes will take place on Tuesday at the beginning of class to assess students' knowledge on the course materials from the week before. A unique password will be provided for each quiz during lecture. Each quiz will expire at the end of Wednesday of that week. ***No make up quizzes will be given.***
- **Hands-on Lab Report (40%):** The purpose of the hands-on lab is to develop your understanding of the material and your skills in problem-solving. Hands-on lab reports are only accepted in Canvas. You must submit lab report on time to receive full credit.
- **Midterms (MT) (20%):** MT1 (10%): October 14, 2021, MT2 (10%) November 16, 2021. No make-up exams will be given if a student misses the midterm exam submission deadline (unless you have a legitimate excuse or other personal emergencies and can provide documented evidence).
- **Final Project & Presentation (20%):** The final project is a group project. Each group consists of 3-4 students. Here are the key deliverables and due dates:
 - Team Formation: September 23, 2021.
 - Project proposal: October 7, 2021.
 - Progress Report: November 9, 2021.
 - Final Project Due: November 30, 2021.
 - Presentation: Each group gives a 10-minute, in-class presentation via Zoom on Nov 30 or Dec 2, 2021, during class time.
- **Final Exam (10%):** December 8, 2021, 12:15 - 2:30 PM

TEXTS/READINGS

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

GRADING INFORMATION

Grading calculation will be based on the following:

- 10% Quizzes
- 40% Hands-on Lab Reports
- 20% Midterm I & II
- 20% Term Project
- 10% Final Exam

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.

Exams and any assignments: You may only submit your own work. Copying and any other form of cheating will not be tolerated and will result in a failing grade (F) for the course, as well as disciplinary consequences the university.

Makeup 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 plus	72.0 – 76.99	C
93.0 – 96.99	A	70.0 – 71.99	C minus
90.0 – 92.99	A minus	67.0 – 69.99	D plus
87.0 – 89.99	B plus	62.0 – 66.99	D
82.0 – 86.99	B	60.0 – 61.99	D minus
80.0 – 81.99	B minus	<60.0	F
77.0 – 79.99	C plus		

VIRTUAL CLASSROOM PROTOCOL

- **Live Session via Zoom:** Live Zoom meetings will be used as dual-purpose virtual classrooms. A meeting can be a regular lecture room, or it can be a computer laboratory for hands-on team exercises in break-out rooms.
- **Lecture Mode:** This is when Zoom is used as a virtual lecture room. You are expected to listen and follow the lecture. Be considerate to your classmates and follow the lecture. Keep your microphone muted except when speaking to the instructor. You may use the chat in Zoom to post questions during lecture.
- **Lab Mode:** Zoom break-out rooms will be use to group you into teams of three or more to work on hands-on lab exercises. Work collaboratively on the exercises and share your ideas and solutions with your classmates.
- **Attendance:** Live virtual class attendance is strongly encouraged. Follow the rules of netiquette. Be respectful. Dress appropriately if you are going to participate in the virtual classroom with the camera on.
- **Recording of Zoom Classes:** The instructor will record the live virtual classes using Zoom and the recordings will be shared in the Canvas course shell. If you do not wish to be identified in a class recording, please contact the instructor to arrange an “anonymous” option prior to class.
- **Zoom recordings and course materials:** You are allowed view the Zoom recordings for your own study purposes only. You may not record any course materials. You may not share any class recordings or course materials with someone who isn't enrolled in the without permission from the instructor. The lecture recordings and course materials are protected by copyright.
- **Accessibility:** If you need accommodations or assistive technology you should work with the Accessible Education Center (AEC) and the instructor.
- **Be Punctual:** Please arrive to the live sessions on time so that you benefit fully from the course experience and do not disturb classmates and the instructor while class is in session.
- **Stay on top of coursework:** You are responsible for knowing all material covered in lectures, assignments, quizzes, and course-related work.

TECHNOLOGY REQUIREMENTS

Students are required to have an electronic device (laptop, desktop or tablet) with a camera and built-in microphone. SJSU has a free equipment loan program available for students (<https://sjsuequipment.getconnect2.com>). Students are responsible for ensuring that they have access to reliable Wi-Fi during tests. If students are unable to have reliable Wi-Fi, they must inform the instructor, as soon as possible or at the latest one week before the test date to determine an alternative. See Learn Anywhere website (<https://www.sjsu.edu/learnanywhere/equipment/index.php>) for current Wi-Fi options on campus.

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>

COURSE SCHEDULE

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

Week	Date	Topics
1	8/19	Syllabus. Introductions. Course Expectations. Obtain galaxy account.
2	8/24	Sequencing technologies and applications
2	8/26	Sequencing technologies and applications
3	8/31	Obtain data from SRA and perform data pre-processing & QC
3	9/2	Obtain data from SRA and perform data pre-processing & QC
4	9/7	Mapping raw sequencing data to a reference genome
4	9/9	Mapping raw sequencing data to a reference genome
5	9/14	DNA variant calling overview
5	9/16	SARS-CoV-2 variant analysis
6	9/21	DNA variant calling for cancer detection.
6	9/23	DNA variant calling for cancer detection. Project Team Formation
7	9/28	RNA sequencing (RNA-seq) overview.
7	9/30	Aligning RNA-seq reads to a reference genome & view them with IGV
8	10/5	Differential gene expression analysis & data visualization
8	10/7	Gene ontology and Gene Set Enrichment Analysis. Project Proposal
9	10/12	Gene ontology and Gene Set Enrichment Analysis
9	10/14	Midterm I
10	10/19	Metagenomic Analysis - 16S rDNA sequencing
10	10/21	Metagenomic Analysis - 16S rDNA sequencing
11	10/26	Metagenomic Analysis - shotgun sequencing
11	10/28	Metagenomic Analysis - shotgun sequencing
12	11/2	Building Bioinformatics Pipelines
12	11/4	Building Bioinformatics Pipelines
13	11/9	Project Progress Report
13	11/11	<i>Veteran's Day (Campus closed)</i>
14	11/16	Midterm 2
14	11/18	Building Bioinformatics Pipelines

Week	Date	Topics
15	11/23	Review
15	11/25	<i>Thanksgiving holiday (Campus closed)</i>
16	11/30	Project Due. Project Presentations
16	12/2	Project Presentations
17	12/8	Final Exam: 12:15 PM - 2:30 PM

Important dates:

08/31/2021: Last Day to Drop a Class without a "W" grade

09/08/2021: Last Day to Add Courses for Fall 2021.