San José State University
Department of Chemistry
Chem 131B, Biochemistry Lab, Spring 2022

Course and Contact Information

Instructor: Dr. Ningkun Wang

Office Location: DH 607

Telephone: (408) 924-4955

Email: ningkun.wang@sjsu.edu (preferred method of contact)

Office Hours: Tue and Thu 12:00 PM– 1:00 PM, and by appointment

Class Days/Time: W 2:30 pm – 5:20 pm, F 1:30 pm – 5:20 pm

Classroom: DH 611 and DH609

Prerequisites: CHEM 100W, CHEM 130A, CHEM 131A **(with grades of "C" or better; "C-" *not accepted*)**

Co-requisite: CHEM 130B or CHEM 130C

Canvas Web Page

Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on the Canvas learning management system course website (CANVAS at http://www.sjsu.edu/at/ec/canvas/). ***You are responsible for regularly checking with the messaging system through Canvas to learn of any updates.***

Course Description

This is an in-person course. All students registered for a College of Science (CoS) class with an in-person component must view the CoS COVID-19 Training slides and the SJSU Phased Adapt Plan website and acknowledge reading them according to their instructor's directions. By working together to follow these county and SJSU safety practices, we can keep our college safer. Students who do not follow COVID-19 Safety practice(s) outlined in the training, the SJSU Phased Adapt Plan, or instructions from their instructors, TAs or CoS Safety Staff may be dismissed from CoS buildings, facilities or field sites. Please review this training as needed throughout the semester, as updates will be implemented as changes occur (and posted to the same links).

A capstone course on advanced isolation techniques and enzyme methodology. Chem 131B is the second semester of a two semester biochemistry laboratory course. The laboratory work is associated with intermediate qualitative and quantitative techniques in modern biochemistry. A capstone experience requires students to integrate principles, theories, and methods learned in previous courses throughout the major. Students will be working on research projects that will allow analysis, synthesis, and evaluation of learned knowledge and will communicate the results of the projects effectively in a professional manner.

Learning Outcomes

Chem 131B addresses the following Program Learning Objectives:

Core Chemistry Ideas (Fundamentals)

1. PLO 1.1 - Students will be able to identify, formulate, and solve a range of chemistry problems (fundamental to complex) through application of mathematical, scientific, and chemical principles.

2. PLO 1.2 - Students will be able to recognize, relate, and/or apply chemistry terms and concepts to propose and solve interdisciplinary and multidisciplinary real-world problems.

Experimentation/Lab Practice

3. PLO 2.1. Students will be able to develop an experiment to address a hypothesis using literature and execute the planned experiment using standard chemistry techniques.

4. PLO 2.2 Students will be able to acquire, record, and critically evaluate data through use of instrumentation and software, appropriate record keeping practices, figure preparation, and scrutiny of experimental results.

5. PLO 2.3 Students will be able to recognize and assess laboratory hazards, practice risk minimization, and conduct safe laboratory practices.

Community, Social, Societal Implications

6. PLO 3.1 Students will be able to explore, critique, and reflect on how chemistry relates to society, culture, and issues of equity and ethics that shape their scientific beliefs and identities.
7. PLO 3.2 Students will be able to identify as scientists within the scientific community through constructing peer reviews, engaging in collaborations, and participating in mentorship.

Communication Skills

8. PLO 4.1 Students will be able to design and deliver engaging presentations on diverse chemistry topics in a professional manner and with clear, concise organization that demonstrates mastery of the topic.

9. PLO 4.2 Students will be able to integrate research findings into a concise original written report that either analyzes collected data and obtained results or reviews and reflects on published scientific work.

10. PLO 4.3 Students will be able to identify an audience and construct a message tailored to that audience and act as a science ambassador by conveying the importance of the research or topic of study.

GE Learning Outcomes (GELO)

<u>GE Area R (Earth and Environment) Goal</u>

Students will cultivate knowledge of the scientific study of the physical universe or its life forms.

Students will understand and appreciate the interrelationship of science and human beings to each other.

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

1. Area R GELO (1): Demonstrate an understanding of the methods and limits of a scientific investigation.

2. Area R GELO (2): Apply a scientific approach to answer questions about the earth and the environment.

This course fulfills the GE writing requirement as follows:

Summary of Required Writing
Total writing for the whole semester will include a minimum of 5000 words:
1. In class writing will include maintaining an accurate and up-to-date laboratory notebook.
2. Primer design and DNA sequencing analysis reports.
3. Rough draft of the Research Communication.
4. Final draft of the Research Communication.

"A minimum aggregate GPA of 2.0 SJSU Studies (R, S & V) shall be required of all students as a graduation requirement." To see full text, review University Policy S11-3 at http://www.sjsu.edu/senate/docs/S11-3.pdf.

Course Learning Outcomes (CLO)

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

1. CLO (1): Apply proper laboratory practices including safety, waste management, and record keeping.

2. CLO (2): Use and understand modern biochemical techniques and instruments.

3. CLO (3): Plan, design, and execute experiments based on biochemical literature.

4. CLO (4): Interpret experimental results and draw reasonable conclusions.

5. CLO (5): Communicate effectively through written and oral reports.

Required Texts/Readings

Textbook

No textbook is required for the course.

Other Readings

Relevant Protocols and Manuals for experimental procedures will be posted on Canvas

Other equipment/material

Research laboratory notebooks will be kept online using Google Docs (ensure the lab instructor and TA's have access on the first week of class); scientific calculator (equivalent to Ti 30). No graphing calculators, unless memory is cleared by the instructor.

Library Liaison Anne Marie Engelsen (annemarie.engelsen@sjsu.edu)

Course Requirements and Assignments

"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 3 hours per unit per week with 1 of the hours used for lecture) for instruction or preparation/studying or course related activities including but not limited to internships, labs, clinical practica. Other course structures will have equivalent workload expectations as described in the syllabus." More details about student workload can be found in University Policy S12-3 at http://www.sjsu.edu/senate/docs/S12-3.pdf.

Assignments The course will consist of the following:

Assignments	***Points***
Primer Design Report	25
Journal Article Presentation	55
Midterm Exam (March 11th)	50
Pre-lab Quizzes	50
Drafts for Research Communication	80
Notebook Checks	100
Problem Sets (5 out of 6)	100
Final Poster Presentation	40
Final Research Communication (Due May 20th)	100
Total	***600***

Instructor Evaluation

The instructor evaluation is based on technique, performance, lab organization, lab work, comprehension of experiments, safety, attitude, proper use and disposal of chemicals, preparation prior to class, following directions, lab/lecture involvement, group dynamic, and participation, etc.

Exams and Quizzes

A midterm along with problem sets and pre-lab quizzes will be given in the semester. The midterm will be given during one of the scheduled lab periods. The date is given on the attached schedule. The problem sets will be given throughout the semester as take-home assignments. The pre-lab quizzes will be given on Canvas. Exams, problem sets and pre-lab quizzes will cover theory, experimental protocol and data analysis. The content will be a combination of objective calculations, short answer, short essay questions, and multiple-choice. Calculators (non-graphing, no memory) are permitted during exams.

Laboratory Notebook

It is imperative that all experimental data are recorded in the laboratory notebook and that this information is

kept up-to-date. Never depend on your memory to record such data; you will forget it if it is not written down. Notebook entries should be clear and concise. Entries should be neat enough and annotated so that the experimental notes and data can be read and understood by others. Your notebook will be graded on these criteria.

It is important to note that in professional settings, the notebook is the primary document verifying your intellectual property. Establishing good notebook habits now will prepare you for your career.

You will use Google docs to maintain the Laboratory Notebook. Ensure that notebook pages are up to date and completed by the end of each laboratory period. *Since notebooks will be kept as a Google doc, the instructor will be checking notebooks periodically. The students will be reminded in class every day to ensure that these notebooks are kept up to date.* Feedback will be given to ensure the correct information and materials are found in the notebook.

Research Communication Paper

A report of all laboratory work will be required in the form of a scientific journal article, specifically based on the ACS Biochemistry journal. This is to be completed outside of the lab period (with some class time dedicated to help with this). The required content and format will be explained in class with appropriate PDF files posted on Canvas. *Although the experiments may be performed in groups, all interpretations must be your own.* Details regarding the format of the paper will be available on Canvas and discussed periodically. ***The final communications paper is limited to an overall 1,500-word maximum (1,000 word minimum for main text with 250 word limit for abstract), not including figures and tables.***

Oral Presentations

Two oral presentations are required. One presentation is a poster presentation covering background and work done towards the laboratory project (will be presented near the end of the semester). The other presentation is a "journal article" presentation. *The instructor must approve the journal article and the approved journal article must be submitted to the instructor by the indicated deadline.* The selected article should be closely related to the laboratory project. The required content and format will be explained in class and posted on Canvas.

University Policy F69-24 at http://www.sjsu.edu/senate/docs/F69-24.pdf states, "Students should attend all meetings of their classes, not only because they are responsible for material discussed therein, but because active participation is frequently essential to insure maximum benefit for all members of the class. Attendance per se shall not be used as a criterion for grading."

Grading Information

Points will be distributed as described above. The instructor reserves the right to scale exam grades. If scaled, scores will never be scaled down from your raw score. Generally, the average score on an exam will be scaled to the C+/B- range, though I reserve the right to adjust this in either direction if, in my estimation, the class overall performed differently than a "typical" class. The course grade will be determined from the resulting average of the point total as follows:

Percent Average	Final Course Grade
97-100	**A+**
94-96	**A**
90-93	**A-**
87-89	**B+**

84-86	**B**
80-83	**B-**
77-79	**C+**
74-76	**C**
70-73	**C-**
67-69	**D+**
64-66	**D**
60-63	**D-**
< 60	**F**

Missed Exams and Quizzes

If an exam or quiz is missed without a legitimate excuse a scaled score of 0 will be entered for that exam or quiz. If an acceptable excuse is provided, then the exam grade will be prorated. In no case will a make-up exam or quiz be given.

Exam Re-grades

The student has ***7 calendar days from the date they have received the exam*** to bring to my attention any perceived errors in grading. However, in doing so, I have every right to review the entire exam, re-grade and adjust the grade accordingly, whether it is to your advantage or disadvantage. Only one re-grade per exam is allowed and the score given on the re-grade is final. Important to note that no re-grade will be accepted or considered after the 7-day period.

To request a re-grade, the student should:

1. On a separate sheet paper, note the question(s) or problem(s) that the student wants to the instructor to review (keeping in mind that I have the right to review the entire exam).
2. Include your justification for the re-grade (what do you think is the problem with the way the question or problem was graded?) Include any supporting information such as a page from the lecture, slides, or textbook, etc…
3. Submit all of the necessary information to the instructor 7 days from the date the exam was received.

It is important to note: Re-grade requests based on another student's graded exam (for example, "Another student answered the same question the same way I did and received more points") will require that both exams be submitted for a re-grade so that both may be adjusted, if necessary. Errors in adding scores is not considered a re-grade, so submitting an exam for this type will not be checked otherwise. Be aware that students who submit frivolous re-grade requests may become ineligible to receive future letters of recommendation from me.

Late Assignments and Misc. Information

The student assignments are due at the beginning of the laboratory period, unless otherwise stated. Assignments submitted on the due date but later than the beginning of class are considered late and subject to 5% point reduction (and subsequent 5% point reductions for each further day late).

"Passage of the Writing Skills Test (WST) or ENGL/LLD 100A with a C or better (C- not accepted), and completion of Core General Education are prerequisite to all SJSU Studies courses. Completion of, or co-registration in, 100W is strongly recommended. A minimum aggregate GPA of 2.0 in GE Areas R, S, & V shall be required of all students."

Note "All students have the right, within a reasonable time, to know their academic scores, to review their grade-dependent work, and to be provided with explanations for the determination of their course grades." See University policy F13-1 at http://www.sjsu.edu/senate/docs/F13-1.pdf for more details.

Safe and Respectful Community

Students are expected to arrive on time and attend all classes. Students should be courteous and professional to other students, the instructor, teaching assistants, and guest instructors.

We hope that the classroom and laboratory will serve as an environment that will promote learning and the development of new ideas, as well as be a safe and respectful community. ***Behavior that interferes with the normal academic function in a classroom or lab is unacceptable. Students exhibiting this behavior will be asked to leave the class.*** Examples of such behavior include:

a) Persistent interruptions or using disrespectful adjectives in response to the comments of others.
b) The use of obscene or profane language.
c) Yelling at classmates and/or faculty.
d) Persistent and disruptive late arrival to or early departure from class without permission.
e) Physical threats, harassing behavior, or personal insults (even when stated in a joking manner).
f) Use of personal electronic devices such as laptops, cell phones, tablets in class, unless it is part of the instructional activity.

The university has a brochure on student conduct that you can view at http://www.sjsu.edu/studentconduct/docs/ENGLISH Brochure.pdf.

Laboratory Safety

NO FOOD OR DRINKS ALLOWED IN THE LABORATORY AND APPROPRIATE ATTIRE WORN. No open toed shoes or tank tops, long hair should be pulled back. You should read the safety section of the SJSU Catalog under the Chemistry Department. Note in particular: "Failure to comply with proper procedures and prescribed safety cautions shall subject the student to disciplinary action. 1) Any student who engages in unauthorized experimentation or who seriously disregards safety, thereby endangering self or others shall be withdrawn immediately from the class with a grade of F. 2) Any student who shows persistent disregard for safety may have his/her grade lowered, and may risk being withdrawn with a final grade of F."

NOTE: A safety quiz will be give on Canvas and must be passed with a grade of 80% or better. The quiz will be based on the SJSU Chemistry Department Safety Rules found at: http://www.sjsu.edu/chemistry/Documents/Safety%20Sheet%20for%20Teaching%20Laboratories_012017.pdf.

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/.

Chem 131B, Biochemistry Lab, Spring 2022, Course Schedule

The schedule is subject to change. Changes will be noted in class or posted on Canvas.

Course Schedule

Week	Date	Lecture	Lab	Assignments Due
1	Jan. 26	Intro to lab, cellulase and project background. (Virtual)		
1	Jan. 28	Safety Training (Virtual)		***Lab Safety Quiz***
2	Feb. 2	Bioinformatics analysis and Benchling tutorial (Virtual)		***Google Doc Access***
2	Feb. 4	PCR and Gibson assembly. Primer design (Virtual)		
3	Feb. 9	DNA extraction from native material and DNA agarose gel	First half check in	
3	Feb. 11	DNA extraction from native material and DNA agarose gel	Second half check in	***Primer Design Report***
4	Feb. 16	Brief review: DNA extraction and Cloning	Extract DNA from cow rumen followed by PCR to clone out gene	***Problem Set #1***
4	Feb. 18	Transformation	DNA agarose gel analysis followed by Gibson Assembly	
5	Feb. 23	Colony PCR	Transformation	***Journal Articles for Presentations***
5	Feb. 25	DNA extraction from *E. coli*	Colony PCR	
6	Mar. 2	DNA sequence analysis	Plasmid DNA extraction and preparation for sequencing	***Problem Set #2***
6	Mar. 4	Recombinant bacterial expression and growth	DNA sequence analysis and transformation into BL21(DE3) cells	
7	Mar. 9	Total protein extraction	Bacterial growth expression, prepare buffers	***Problem Set #3***
7	Mar. 11	***Midterm Exam***		
8	Mar. 16	***Journal Article Presentations – Rd #1***		
8	Mar. 18	***Journal Article Presentations – Rd #2***		
9	Mar. 23	***Journal Article Presentations – Rd #3***		

Week	Date	Lecture	Lab	Assignments Due
9	Mar. 25	SDS-PAGE	Total protein extraction	***Intro Draft***
10	*Mar. 30*	*Spring Recess – No Class*		
10	*Apr. 1*	*Spring Recess – No Class*		
11	Apr. 6	Nickel affinity protein purification	SDS-PAGE analysis and prepare buffers	
11	Apr. 8		Protein purification with Ni-NTA column, flash freeze	***Peer Review of Intro Draft***
12	Apr. 13	Protein quantification	SDS-PAGE analysis of protein purification	***Problem Set #4***
12	Apr. 15	Cellulase activity assay: semi-quantitative	Bradford Assay and analysis	
13	Apr. 20	Cellulase activity assay: kinetic	Semi-quantitative cellulase activity assay	***Problem Set #5***
13	Apr. 22		Kinetic cellulase activity assay	***Results and Discussion Outline***
14	Apr. 27		*Slush days for experiments/desk work*	***Problem Set #6***
14	Apr. 29			***Figures Draft***
15	May 4	Share results, big picture overview		***Abstract***
15	May 6	Poster tips		
16	May 11	Career talk	Check out	***Results and Discussion Draft***
16	May 13	***Group Research Poster Session***		
Final	May 20			***Communications Paper Due at 12:15 pm***