

CHEM 333 Biophysical Chemistry

Fall 2022 Syllabus

Important Note: This syllabus, along with course assignments and due dates, are subject to change. It is the student's responsibility to check Canvas for corrections or updates to the syllabus. Any changes will be clearly noted in a course announcement or through email.

Instructor: Dr. Amanda Jonsson

Office: CBB 400

Office Hours:

Day	Time	Location
Monday	2 – 2:50 p.m.	CBB 400 (my office)
Tuesday	2 – 2:50 p.m.	CBB 400 (my office)
Wednesday	4 – 4:50 p.m.	CBB 190 (Drop-In)
Thursday	11 – 11:50 a.m.	CBB 400 (my office)
Friday	11 – 11:50 a.m.	CBB 190 (Drop-In)

E-mail: ajonsson@uwsp.edu

*****The best way to contact me is by email*****

Instructor Schedule

Time	Monday	Tuesday	Wednesday	Thursday	Friday
8:00					
9:00					
10:00	Chem 333 CBB 265		Chem 333 CBB 265		Chem 333 CBB 265
11:00		Chem 105 04L2 CBB 226		<i>Office Hour</i> CBB 400	<i>Office Hour</i> CBB 190
12:00					
1:00	Chem 105 CBB 105		Chem 105 CBB 105	Chem 105 CBB 105	Chem 105 CBB 105
2:00	<i>Office Hour</i> CBB 400	<i>Office Hour</i> CBB 400	Meeting*	Chem 105 Lab 04L3 CBB 230	Meetings / Seminars*
3:00					
4:00		Chem 298 CBB 261	<i>Office Hour</i> CBB 190		

*does not meet every week

Meeting Times

Lecture: Monday, Wednesday, Friday 10 – 10:50 a.m. in room 265 of the Chemistry Biology Building

Course Description

Examine physiochemical principles underlying structure and chemical properties of macromolecules of biological importance, including principles of thermodynamics, equilibrium, kinetics, and dynamics. Includes methods for separation and isolation of macromolecules and their spectroscopic characterization.

Course Prerequisites

This course has several prerequisites: Chem 365 (Biochemistry I), Math 225 (Calculus I), and Phys 204 (College Physics II) OR Phys 250 (University Physics II). The skills from these courses that will be important for your success in this course include your ability to:

- Identify types of protein secondary structure from [ribbon diagrams](#).
- Recognize different types of protein-ligand binding (i.e., competitive, non-competitive, etc.)
- Interpret signs and magnitudes of thermodynamics quantities (i.e. what does it mean if ΔG is negative, or if K is large?)
- Take derivatives and integrals of functions such as polynomials, trig functions, and natural logarithms.
- Relate the value of an integral to the area under a curve, conceptually and numerically (i.e., the [trapezoid method](#))
- Use mathematical models to describe the behavior of a system and calculate related quantities.

Course Learning Outcomes

1. Carry out calculations related to fundamental thermodynamic and quantum mechanical principles.
2. Analyze data obtained from biophysical techniques.
3. Interpret experimental results.
4. Explain the best choice of biophysical methods to use in order to address a given research question.
5. Summarize important information from journal articles including: the hypothesis, the relevance/importance of the research area, and the conclusion reached.

Required Materials

Textbook

Physical Chemistry Principles and Applications in Biological Sciences, 5th Edition, Pearson, 2014. This book is available for rental at the University Bookstore.

Non-Graphing Scientific Calculator

Your calculator must be able to do logarithms and exponents. You will not be allowed graphing calculators or any calculator with a QWERTY keyboard. Calculators that meet these requirements can be purchased at the University

Bookstore, office supply stores such as Staples or Office Depot, or at other stores such as Target, Walmart, etc. for around \$10.

Student Expectations

I expect that students will watch the required lecture videos before attending class and make every effort to attend class; viewing answer keys after class is not a good substitute for coming to class and working on the activities. During class I expect that students work on the assigned activities collaboratively with their peers and ask questions of each other and the instructor.

Evaluation/Course Requirements

Assignment	Brief Description	Percentage	Learning Outcomes Met
Quizzes	You will take 3 quizzes over the course of the semester to test your ability to carry out different kinds of calculations.	15%	CLO 1
Group Projects	You will complete 4 group projects focusing on data analysis and interpretation.	10%	CLO 2,3
Individual Projects	After each group project you will complete an individual project that will test what you learned about data analysis and interpretation from the group project.	20%	CLO 2,3
Journal Clubs	You will complete four journal clubs where you will complete guided activities to: 1) learn how to read and summarize journal articles 2) practice your data analysis and interpretation skills.	15%	CLO 2, 3, 5
Literature Assignments	You will carry out a series of assignments where you will use what you learned in the journal clubs to explore the use of biophysical techniques on a system of your choice.	20%	CLO 2, 3, 5
Final Project	In this two-part project, you will be given a system, research question, and relevant background information. In part 1 you will devise a research plan explaining what biophysical techniques you would use to address the research question	20%	CLO 2, 3, 4, 5

	and why. In part 2 you will be provided with experimental data and be asked and be determine the answer to the research question.		
Total		100%	

Grading Scale

$93 \leq A \leq 100$	$90 \leq A- < 93$
$87 \leq B+ < 90$	$83 \leq B < 87$
$80 \leq B- < 83$	$77 \leq C+ < 80$
$73 \leq C < 77$	$70 \leq C- < 73$
$67 \leq D+ < 70$	$63 \leq D < 67$
F < 63	

Technology Guidelines

While not necessary, many students like to bring a tablet or laptop to class each day to access and work on course materials. Please make sure that you are using these technologies wisely during class to maximize the benefit of our time together.

For some projects in this course we will be using a free software program called Chimera. Chimera is available on computers within the chemistry department, but some student prefer to download it to their personal computers. Download links and instructions will be provided in Canvas for students who would like to do this.

Cell phone usage: Research supports that having visual access to a cell phone diminishes our ability to learn. Checking social media, texts, emails, and messages is unprofessional and disrespectful to our class community. Please turn off your phone during class; I will do so as well. If I notice that you are using your phone during class I may ask you to share what you are researching or ask you to put it away. Thank you for following these guidelines as they help create a positive learning community.

Inclusivity Statement

It is my intent that students from all diverse backgrounds and perspectives be well-served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that the students bring to this class be viewed as a resource, strength and benefit. It is my intent to present materials and activities that are respectful of diversity: gender identity, sexuality, disability, age, socioeconomic status, ethnicity, race, nationality, religion, and culture. Your suggestions are encouraged and appreciated. Please let me know ways to improve the effectiveness of the course for you personally, or for other students or student groups.

If you have experienced a bias incident (an act of conduct, speech, or expression to which a bias motive is evident as a contributing factor regardless of whether the act is criminal) at UWSP, you have the right to report it using this [link](#). You may also contact the Dean of Students office directly at dos@uwsp.edu.

Attendance

Attending class will likely be the single most important factor in determining your performance and grade in the course, so plan to attend every class. In most class meetings you will be working with your classmates on activities designed to prepare you for quizzes, projects, and other assignments. The relationship between attendance and achievement in education has been extensively documented in peer-reviewed research. Due to the flipped nature of the course all content is available online for you to review at your convenience, but without regular practice at the skills you are developing it is unlikely that you will succeed in this course.

Please refer to the "Absences due to Military Service" and "Religious Beliefs Accommodation" below. Additionally, below are attendance guidelines as outlined by the [UWSP registrar](#):

Attend all your classes regularly. We do not have a system of permitted "cuts." If you decide to drop a class, please do so using myPoint or visit the Enrollment Services Center. Changes in class enrollment will impact your tuition and fee balance, financial aid award and veterans educational benefit.

During the first eight days of the regular 16-week term, your instructor will take attendance. If you are not in attendance, you may be dropped from the class. You are responsible for dropping any of your enrolled classes.

- If you must be absent during the term, tell your instructor prior to the class you will miss. If you cannot reach your instructor(s) in an emergency, contact the Dean of Students Office at 715-346-2611 or DOS@uwsp.edu.
- If you are dropped from a class due to non-attendance, you may only be reinstated to the class section using the class add process. Reinstatement to the same section or course is not guaranteed. Your instructors will explain their specific attendance policies to be followed at the beginning of each course.
- If you take part in an off-campus trip by an authorized university group such as an athletic team, musical or dramatic organization, or a class, make appropriate arrangements in advance with the instructor of each class you will miss. If you are absent from classes because of emergencies, off-campus trips, illness, or the like, your instructors will give you a reasonable amount of help in making up the work you have missed.
- If you enroll in a course and cannot begin attending until after classes have already started, you must first get permission from the department offering the course. Otherwise, you may be required to drop the course.
- If you do not make satisfactory arrangements with your instructors regarding excessive absences, you may be dismissed. If you are dismissed from a class, you will receive an F in that course. If you are dismissed from the University, you will receive an F in all enrolled courses.

Late Work

All assignments, with the exception of group projects (more on that below) will have a built in 48-hour window where you can submit the assignment late without penalty. Students needing an extension beyond this 48-hour window will need to contact Dr. Jonsson to make individualized arrangements and will be given a date by which the assignment must be submitted. These assignments will be graded for full credit. Failure to meet this individual deadline will result in a zero on the assignment. Students who frequently need to make these arrangements may be asked to meet with Dr. Jonsson

Rights and Responsibilities

UWSP values a safe, honest, respectful, and inviting learning environment. In order to ensure that each student has the opportunity to succeed, we have developed a set of expectations for all students and instructors. This set of expectations is known as the *Rights and Responsibilities* documents, and it is intended to help establish a positive living and learning environment at UWSP. Click here for more information:

<https://www.uwsp.edu/dos/Pages/handbook.aspx>

Academic Misconduct

I encourage students to work and study in groups. However, any work submitted for a grade must reflect your own work and understanding of the material. Academic dishonesty will be dealt with following the rules on academic misconduct in the current [UWSP student handbook](#) (UWSP Chapter 14) and, at a minimum, a score of 0 on the assignment. Egregious and/or repeated problems will result in an F in the course. Each student is expected to act with honesty and integrity, and must respect the rights of others to learn in a safe, respectful and inviting environment. *Please do not hesitate to contact me if you have any questions or concerns.*

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I commit to doing my part as well by keeping myself informed on the most recent research and practices that best support inclusive learning. I last completed UWSP's SafeZone training in April 2020.

Equal Access for Students with Disabilities

UWSP will modify academic program requirements as necessary to ensure that they do not discriminate against qualified applicants or students with disabilities. The modifications should not affect the substance of educational programs or compromise academic standards; nor should they intrude upon academic freedom. Examinations or other procedures used for evaluating students' academic achievements may be adapted. The results of such evaluation must demonstrate the student's achievement in the academic activity, rather than describe his/her disability.

If modifications are required due to a disability, please inform the instructor and contact the [Disability Resource Center](#) to complete an Accommodations Request form.

Course Schedule

Please note that the schedule below is tentative and is subject to change. Check the weekly plans on the course Canvas page for the most up to date information on the schedule of course activities as well as for links to video lectures and/or reading assignments.

Week	Topics/Learning Activities	Assessments
1 (9/6)	Course Introduction, General Chemistry and Math Reviews, the first law of thermodynamics.	
2 (9/12)	Atomic force microscopy, heat, work, and internal energy.	Quiz #1 on Friday (Math/Gen Chem Review quiz)
3 (9/19)	Enthalpy, entropy, differential scanning calorimetry, free energy, and equilibrium constants	
4 (9/26)	Isothermal titration calorimetry and ligand binding.	Quiz #2 on Friday (thermodynamics)
5 (10/3)	Workdays on Journal Club #1 and Group Project #1	Journal Club #1 due on Wednesday
6 (10/10)	Workday on Group Project #1, wavefunctions, normalization.	Individual project #1 on Wednesday
7 (10/17)	One-dimensional particle in a box, Boltzmann distributions, spectroscopy, and absorption	
8 (10/24)	Biological molecules and UV-VIS, fluorescence lifetime, and quantum yield	Quiz #3 on Tuesday (quantum mechanics)

9 (10/31)	Quenching, Workday on Journal Club #2, workdays on group project #2	Journal Club #2 due on Friday
10 (11/7)	Workday on group project #2, fluorescence energy resonance transfer	Individual project #2 on Wednesday Literature Assignment #1 due Friday
11 (11/14)	Circular dichroism in proteins and DNA, workday on Journal Club #3	
12 (11/21)	Workdays on group project #3 Thanksgiving: no class on Friday	Journal Club #3 due on Monday Literature Assignment #2 due Wednesday
13 (11/28)	Workdays on group project #3, NMR basics, COSY, HSCQ, and NOESY,	Individual Project #3 on Wednesday
14 (12/5)	Workday on Journal Club #4 and on group project #4	Literature Assignment #2 due on Tuesday Journal Club #4 due on Friday Literature Assignment #3 due Friday
15 (12/12)	Workdays on group project #4	Final Project Part 1 due on Monday Individual project #4 on Wednesday
12/16	Friday December 16 th 8 – 10 a.m.	Final Project Part 2

Notes:

- 1) Quizzes and individual projects will be completed and handed in during class. Student missing class those days should contact Dr. Jonsson to make arrangements to complete the activity within 2 business days.
- 2) Journal clubs and literature assignments will be submitted to Canvas and will have an automatic 48-hour late window. Assignments submitted during that window will receive full credit.
- 3) Group projects must be completed before the individual project. You are encouraged to check your work with me as you go to ensure you complete the group projects correctly. The latest I will accept a group project is when you turn in your individual project.