Biochemistry I Lecture & Lab Schedule
BB421 & BB621, Section A2 (Fall 2024)

Course inf website: learn.bu.edu

Staff	Phone	Office	E-mail	Office Hours
Dr. Dean Tolan (A1 lecture)	3-5310	Rm 702 & 704, 24 Cummington (LSE)	tolan@bu.edu	Mon 2-3 Fri 3:30-4:30 Or by appointment
Dr. Pinghua Liu (A2 lecture)	3-2481	SCI 453 (590 Commonwealth Ave.)	pinghua@bu.edu	Tue. 5:30 – 6:30 PM Friday: 5:30 – 6:30 PM
Dr. Blair Szymczyna (Lab)		SCI 452 (590 Commonwealth Ave.)	bszymcz@bu.edu	TBA or by appointment

Lecture Tue. & Thur. 3:30 PM – 5:15 PM CGS 505

Pre-lab Discussions

Tue. 12:30 PM – 1: 45 PM (C1) SCI109

Tue. 2:00 PM – 3:15 PM (C2) COM 101

Laboratory

I	8:00 AM – 12:00 PM (Wed.)	SCI 162
II	1:25 PM – 5:25 PM (Wed.)	SCI 162
III	6:30 PM – 10:30 PM (Wed.)	SCI 162
IV	8:00 AM – 12:00 PM (Thur.)	SCI 162
V	1:25 PM – 5:25 PM (Thur.)	SCI 162
VI	6:30 PM – 10:30 PM (Thur.)	SCI 162
VII	8:00 AM – 12:00 PM (Fri.)	SCI 162
VIII	1:25 PM – 5:25 PM (Fri.)	SCI 162
IX	6:30 PM – 10:30 PM (Fri.)	SCI 162
X	10:10 AM – 2:10 PM (Mon.)	SCI 162
XI	3:35 PM – 7:35 PM (Mon.)	SCI 162

621 Discussion (Grad Students)

TBA TBA

Prerequisites: Students are **REQUIRED** to have passed (≥C) two semesters of organic chemistry (CH 204/212/214)

Website: For this course (A2 lectures) will be on *BlackBoard.* On the BlackBoard site you will find important information and resources relating to the course, including class announcements, A1 & A2 syllabi, review material, and links to additional sources of information. You can access the site by going to learn.bu.edu and typing in your Kerberos (i.e. BU) password.

Course overview: Biochemistry I is intended to provide an in-depth introduction to the molecular building blocks of life (i.e. proteins, including enzymes; nucleic acids; carbohydrates; and lipids) and how they function, for students majoring in BMB, Chemistry, and other STEM disciplines. For many students, BI/CH 421 serves as the first half of a two-semester sequence, in which the second semester (BI/CH 422) introduces the central concepts and pathways of metabolism. Other students will take only BI/CH 421, as a stand-alone course. Achieving a thorough understanding of the key concepts in Biochemistry requires exposure both to theoretical concepts and to the experimental techniques by which these concepts were discovered and are applied in pursuits such as biomedical research, biotechnology, and drug discovery. The course thus comprises a lecture component (A1 & A2 sections), a laboratory component (B section), and a laboratory discussion (C section). You should be therefore registered for BI/CH 421 A1 or A2 (lecture section) plus one section each of BI/CH 421 B, and C. There is no lecture discussion.

IMPORTANT: Biochemistry builds upon the principles you learned in General Chemistry and Organic Chemistry, to understand the structure and functions of the often large and complex molecules that drive and regulate the processes of life. Therefore, **mastery of the subject matter covered in these prior courses is essential if you are to succeed in BB 421**. In particular, Biochemistry requires a thorough understanding of the following concepts: pH; weak acids and bases and pK_a; aqueous solution and solubility; the thermodynamic principles of enthalpy, entropy, and free energy; oxidation/reduction; intermolecular forces (van der Waals, dipole-dipole, charge-dipole, hydrogen bonds); stereochemistry; and the structures, acid/base behavior, and reactivity of common organic functional groups such as alcohols, amines, carboxylic acids, amides, etc. If you are not fully confident in your knowledge and understanding of any of these topics, you should use your old course notes and textbooks to review them early in the semester. We will also provide some resources to help with this.

Textbooks: The required text for the lecture section is "*Lehninger's Principles of Biochemistry*" by Nelson and Cox. The current version of this book is the 8th Edition, but you are welcome to use the previous edition if you prefer. However, **if you plan to take BB 422 in the Spring, you should make sure to buy the latest (8th) edition**, as this edition will be required for that course.

Some students find a Study Guide and Solutions Manual to be a useful accompaniment to the textbook. For the 8th Ed of Lehninger, the study guide takes the form of the online *Achieve* system, which you can purchase with the textbook. For the 7th Ed of Lehninger, the study guide is "*The Absolute, Ultimate Guide to Lehninger Principles of Biochemistry*" by Nelson and Cox, which contains detailed worked solutions to the end of chapter problems in the text.

You will also need a subscription to TopHat for lecture, as well as the additional materials detailed in your Laboratory syllabus. **The Join Code for Top Hat is:** 557758. 852219

Grading: Your overall course grade will be calculated from the weighted sum of your scores on (i) the mid-term exams, (ii) the Final Exam, (iii) the lab and, if you are registered for the graduate section under course number BB 621, (iv) your Final Paper and Discussion. In calculating your overall grade, these components are weighted as follows:

BB 421: Lab 30%, midterm exams 36%, Final Exam 24%, Achieve homework and TopHat, etc. 10%.

BB 621: Lab 25%, midterm exams 30%, Paper & Discussion 15%, Final Exam 20%, Achieve, TopHat, etc. 10%.

Grade Changes: Except for Incomplete grades, a course grade cannot be changed after six months.

Lecture: The lecture will start promptly at the scheduled time (A2 section is 3:00 PM – 5:15 PM (Tue. & Thur.) at SAR 101). **It is important that you arrive a few minutes early, so you can be in your seat and ready to begin on time**. Note: important announcements about up-coming examinations and other matters are often made at the start of the lecture.

You should feel free to ask questions during the lecture. That is part of what the lecture is for, and we strongly encourage it. If you are attending lecture in person and wish to ask a question, raise your hand and the instructor will get to you as soon as they reach a suitable break. We feel very strongly that there is no such thing as a stupid question. If, after some thought, you're still unsure about something, then you can bet that a lot of your classmates are too. We expect each of you to listen respectfully, as we will, to any

questions your classmates ask in class, even if the answer seems obvious to you, as you should expect other people to be appropriately respectful when you have a question.

The following are inappropriate during lectures: Use of cell phones (except for TopHat, when directed), text messaging/instant messaging, mp3 players or other personal music players, sleeping, talking.

Examinations: There will be **THREE** "mid-term" exams during the semester, and a cumulative Final Exam. Tentative dates for these exams are given on the last page of this syllabus. These dates are subject to change, but you will always be given at least one week's advance notice of any exam. The locations of these mid-terms will be at the same lecture hall or will be provided nearer the time if there are changes.

Missed exams due to ill-health or other legitimate reasons: Students who are unable to attend an examination due to a serious illness, a personal emergency, or a religious observance should contact Dr. Liu to make alternative arrangements **as soon as possible and definitely BEFORE missing the exam**. No make-up exams will be arranged after the exam is given to the rest of the class.

Exam accommodations: If you need any special accommodations for this course, in lecture or lab, such as extra time to complete assessments, specific room requirements during exams, etc, you need to notify Prof. Liu about your needs ASAP, and **in no circumstances later than Monday Sept. 17th**. We need time to plan for these special arrangements, last minute requests may not be accommodated. Even if you do not yet have formal documentation to support your request, you should let us know about your needs as soon as possible.

Exam Regrades: We do our best to grade exams promptly and accurately. In cases where you feel a mistake has been made in grading your exam, you need to bring this to your instructor's attention within **one week** of receiving your graded exam. No changes will be considered once this one week "review" period is complete. If the error is a simple mistake (i.e. – we added the points on the page incorrectly), it will be quickly corrected. However, if your concern is that you believe a correct answer was mistakenly marked wrong, or about allocation of partial credit, **be aware that we will regrade the entire exam and will not limit the regrade request to one particular question**.

Homework Problems: At the end of the last page of lecture PPT, some suggested questions will be listed. Completion of these ungraded problem sets will enhance your understanding of the material and help you to identify concepts that you need additional help mastering. You are encouraged to work these problems independently or in small study groups. Any questions you have about these problems, or concepts from lecture or assigned reading, should be addressed at Prof. Liu's office hours or TFs' office hours. At least **10%** of the points on each exam to come **directly** from these suggested problems and discussion questions.

Class participation extra credit: Throughout the semester, we will provide numerous opportunities to participate in lecture via Top Hat. **You must be in the lecture hall to answer TopHat lecture questions. Using another student's TopHat account to submit answers in their name is a violation of the Academic Conduct Code on the part of both students, and will be treated accordingly.** Your TopHat participation can result in a maximum of 5 pts of your grade for this course. The amount of credit you receive depends mostly on what proportion of questions you answer over the course of the semester: 80-100% = 5 pts; 60-79% = 3.5 pts; 45-59% tophat score = 2 pts; 30-44% = 1 pts; below 30% = 0 pts. In past years, well over half the class (65-70%) had a Top Hat score of 80% or better and earned full participation points. We expect it will be the same this year, so you do not need to be overly concerned about when TopHat is glitchy or you have difficulty connecting on a particular day.

Laboratory: The laboratory portion of this course is run by Dr. Szymczyna. A separate syllabus for the Laboratory will be provided by him.

Office hours: Prof. Liu has Three office hours each week, as well as some review sessions to be scheduled before the exam.

Slightly small lecture hour discrepancy between A1 and A2 sessions and our solutions: In A1 session, Monday lectures are schedule between 8:00 AM – 9:55 AM because some exams are scheduled for this block. The Wed. and Fri. lectures are 9:05 – 9: 55 AM. For the A2 sections, lectures are scheduled between 3:30 PM – 5:15 PM. We tried our best to match the lecture time between the two sections. The rest will be reserved as reviewing and discussion session to help both A1 and A2 sessions to prepare for exams.

Some days will be reserved as reviewing sessions. However, **we strongly encourage all students to take advantage of the opportunity of the office hours to get extra one-on-one help from us when you need it.** We are also happy to answer short questions by e-mail. But please do not e-mail your instructors to ask for information that is contained in the Syllabus. If you have questions about grading or other class policies, please consult the Syllabus first.

Workload: You should expect to spend at least 8 hours per week outside of class studying for the lecture portion of BB 421/621 (i.e. ~4 hrs per lecture). The required work includes (i) reading the textbook in preparation for class, (ii) rewriting your lecture notes after class, and (iii) working on the homework problems. This is in addition to work associated with the laboratory portion of the course.

The success students have in this course is strongly linked to how much time and effort they put into it, so if you want to succeed be prepared to consistently do the necessary work.

Study groups: Many students find it useful to form study groups that meet on a regular schedule during the semester. Study groups provide students with a chance to

- discuss problems with other students
- explain concepts to other students

Academic Conduct: All students at Boston University are expected to maintain high standards of academic honesty and integrity. The Chemistry Department treats cheating with zero tolerance. Here, cheating refers to any violation of the student academic conduct code. There are no small infractions. All instances of misconduct will be reported to the Dean's office. It is the responsibility of every student to be aware of the Academic Conduct Code's contents and to abide by its provisions, as detailed at: http://www.bu.edu/academics/resources/academic-conduct-code/

Excused Absences: We affirm the BU Policy on Religious Observance. Absences for documented religious observances will be excused according to the specifications of the University Policy on Religious Observance (http://www.bu.edu/ctl/university-policies/policy-on-religious-observance/). Please make sure to communicate about religious observances as far in advance as possible (and no later than one week before the observance, per university policy) so that accommodations can be made. For other students who must be absent for legitimate reasons (besides religious observations: validated medical issue or serious personal reasons), you will be given an opportunity, if possible, to make up missed work.

Absences due to Illness: We hope that all of you will remain healthy throughout the semester, and are able to fully engage and participate in the course. If you did unfortunately become ill, we require that you follow the protocols mandated by the University under those circumstances. The course attendance and engagement policies already reflect substantial flexibility to allow for absences of short to moderate length due to illness. Please make sure to contact your instructor immediately about any absences that will last beyond a couple of days, and certainly inform your instructor immediately about any missed in-person work in labs. In the case of a prolonged illness that is not already covered by the course absence policies, we will work with the CAS Dean's office to determine the best course of action for any given student.

COVID: What to do if you test positive or are required to isolate: Most importantly, (1) if you are sick, make sure you seek proper medical care; (2) For COVID, please notify Prof. Liu and lab instructors so we can help support you through your isolation period. We will work with you, to the extent possible, to ensure that you can continue with your studies to the extent your health permits, and that you do not lose credit for assignments that you are forced to miss due to your illness/isolation. Prolonged absences (i.e. more than 1-2 weeks) due to illness with COVID will be handled according to the "Absences due to illness" policy outlined above.

Office of Disability and Access Services: The Office of Disability and Access Services (25 Buick Street, Suite 300) is responsible for assisting students with disabilities. If you have a disability, you are strongly encouraged to register with this office. Lecture hall and discussion rooms are accessible and ADA compliant. Learning and testing accommodation: Boston University complies with the Americans with Disabilities Act and Section 504 of the Rehabilitation Act. If you are a student who needs academic accommodations because of a documented disability, you must present your letter of accommodation from the Office of Disability and Access Services directly to the instructor as soon as possible. If you have questions about documenting a disability or requesting academic accommodations, contact the Office of Disability and Access Services. Letters of accommodations should be presented as soon as possible to ensure that student needs are addressed from the start of the course. Instructors are not able to provide accommodations without documentation from Boston University's Office of Disability and Access Services.

Proper use of Online Resources: Students at Boston University are required to abide by all of regulations regarding academic integrity and conduct, including the proper use of technology and digital resources. Course materials are provided by faculty for your personal use in the course only. Any other use of these materials including, but not limited to, posting of materials online in forums or websites, is a copyright violation and a violation of the academic conduct code. Additionally, materials submitted for course credit (papers, exams, etc.) are similarly not permitted to be used or posted.

Incompletes: The use of incompletes will adhere to the College of Arts and Sciences rules. This is generally for and circumstances prevent the student from completing remaining requirements by the conclusion of the course. A substantial amount of work must have been satisfactorily completed before approval of such a grade is given. The instructor and student must sign the Incomplete Grade Agreement indicating the nature of the work and a date by which all course requirements must be completed.

Statement on copyrighted course materials: The syllabus, course descriptions, text slides, and handouts created by the Professors of this course, and all class lectures, are copyrighted by Boston University and your course instructors. Except with respect to

enrolled students as set forth below, the materials and lectures may not be reproduced in any form or otherwise copied, displayed or distributed, nor should works derived from them be reproduced, copied, displayed or distributed without the written permission of the Professors. Infringement of the copyright in these materials, including any sale or commercial use of notes, summaries, outlines or other reproductions of lectures, constitutes a violation of the copyright laws and is prohibited. Students enrolled in the course **are allowed** to share with other enrolled students course materials, notes, and other writings based on the course materials and lectures, but may not do so on a commercial basis or otherwise for payment of any kind. Please note in particular that selling or buying class notes, lecture notes or summaries, or similar materials both violates copyright and interferes with the academic mission of the College, and is therefore prohibited in this class and will be considered a violation of the student **Academic Conduct Code** of responsibility that is subject to academic sanctions.

Diversity and Inclusion: Students and faculty each have responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, color, culture, religion, creed, politics, veteran's status, sexual orientation, gender, gender identity and gender expression, age, disability, and nationalities.Please consult BU website for related policy.

Class rosters are provided to the instructor with the student's legal name. The teaching staff will gladly honor your request to address you by an alternate name or gender pronoun. Please advise Prof. Liu of this preference early in the semester so that appropriate changes can be communicated to the staff and the course records.

Boston University is committed to maintaining a positive learning, working, and living environment. The University Policy states that the University and its entities does not discriminate on the basis of race, color, national origin, sex, age, disability, creed, religion, sexual orientation, or veteran status in admission and access to, and treatment and employment in, its educational programs and activities. Students who believe they have been discriminated against should contact the Equal Opportunities Office or if harassment under Title IX, contact CAS Advising. Although Boston University requires sexual misconduct prevention training, incidents and experiences occur. We care about student well-being and are committed to maintaining a healthy campus community and awareness and resources are available for anyone who may feel discriminated against or harassed.

Well-being: Students should be mindful of their physical and mental well-being. If you have difficulties in any aspect of maintaining physical and mental health due to circumstances in the course or beyond the course, there are resources available:

The Center for Teaching and Learning has a clearing house of resources available. Among these is the Educational Resource Center's staff is there to work with students who need time management, study skills or academic planning assistance. They hold weekly workshops for students to assist them with test preparation, anxiety, time management, etc. The Education Resource Center offers Peer Tutoring, Writing Assistance, Language Link conversation groups, and Workshops; although, resources for tutoring in biochemistry are limited, they have excellent tutors in the basics of chemistry and biology. The Education Resource Center professional staff is also available to meet with students individually to develop a personalized plan for academic success and/or to assist them in developing specific skills. These services are free and can benefit all students who are interested in improving their academic performance.

The most important aspect of well-being is your mental state. Often during the course of the semester life happens and students may feel overwhelmed. If you are feeling overwhelmed, please do not hesitate to ask for help. As a start, *student health services* offers a variety of mental health resources for you.

Concerns and suggestions: We as instructors are always happy to hear your constructive suggestions for the course, and to address any legitimate concerns that you may have. Please do not hesitate to contact your instructor if you have any suggestions or concerns.

If you are experiencing difficulty, please contact your course instructor without delay. If dropping the course appears to be in your best interest, we still would like to work through the decision with you. We are also happy to advise you on appropriate choices for your academic program. If you drop the course by October 10th, 2023 no record of it will appear on your transcript. Nov. 13, 2022 is the last day to Designate a Course as Pass/Fail, or drop the course with a "W" grade.

The Chemistry department has a Digital Suggestions Box. If you have suggestions, feedback, or concerns that are best addressed directly to the department, please go online and leave your anonymous feedback at: http://bit.ly/BUchemSuggest.

GENERAL EDUCATION: THE BU HUB

Quantitative Reasoning II (QR2)

Quantitative II Outcome 1: Students will frame and solve complex problems using quantitative tools, such as analytical, statistical, or computational methods. Both the lecture and the lab include calculations of force, free energy, entropy, pH, product and reactant concentrations, activities, buffer capacity, calibration curves, normalization, errors and error propagation, inhibition, equilibrium constants. Algebra and calculus, as well as graphical tools are used to solve problems posed in class lecture and data from the laboratory. By the completion of this course, all students will be adept at use of spread sheets such as Excel for data analysis.

Quantitative II Outcome 2: Students will apply quantitative tools in diverse settings to answer biochemical questions. Both statistics and graphs are used in a variety of laboratory exercises, as well as in-lecture quizzes, to answer questions about macromolecular size and purity, enzyme action and kinetic parameters, membrane transport and chemiosmosis, etc. Nearly every week in either lecture or laboratory, new tools and ways of analysis to answer biochemical questions are learned. Communicating quantitative data using graphs and tables supporting various models and communicate this quantitative information visually and numerically is part of many laboratory reports.

Quantitative II Outcome 3: Students will formulate and test an argument by marshaling and analyzing quantitative evidence. For most of the quantitative calculations and tools involved in the course are used to answer a question or formulate an argument, such as what is the relative size of these macromolecules consistent with the argument, or what is the dissociation equilibria for a molecule from the enzyme, and what kind of inhibition is being exhibited?

Quantitative II Outcome 4: Students will communicate quantitative information symbolically, visually, numerically, or verbally. Visual and numerical communication of quantitative information is an essential part of written lab reports; within which questions are formulated and tested by properly displaying data, including the use of statistical analysis. Furthermore, many test questions require answers that communicate of quantitative information in the answer, often reiterating and reinforcing what was done in the lab reports, such as draw the shape of a curve indicating some kind of behavior (binding, allostery, state-transition, etc.) along with proper labeling of axes, etc. There are explicit questions coming from laboratory pedagogy included in the lecture exams.

Quantitative II Outcome 5: Students will recognize and articulate the capacity and limitations of quantitative methods and the risks of using them improperly. Recognition of the limitations of quantitative methods, such as extrapolation versus interpolation from a calibration curve, are constantly taught. Direct feedback on a weekly basis comes from the return of lab reports where these limitations are expected as part of the analysis. In particular, the limitations of significance when doing calculations on spreadsheets like Excel are learned. Lecture emphasizes instances where the correct application of an equation, theory, or calculation is to be used and why.

Critical Thinking (CRT)

Critical Thinking Outcome 1: Students will be able to identify key elements of critical thinking, such as habits of distinguishing deductive from inductive modes of inference, recognizing common logical fallacies and cognitive biases, translating ordinary language into formal argument, distinguishing empirical claims about matters of fact from normative or evaluative judgments, and recognizing the ways in which emotional responses can affect reasoning processes. Building on formal teaching in distinguishing the inductive and deductive parts of the scientific method, students in biochemistry will put these forms of logic to work by developing hypotheses in laboratory write-ups and deducing the conclusions from data in lecture exams. The 421 course will amplify these skills by weekly or daily interrogations about data presented in class or measured in the laboratory. Students will have to describe the questions being tested and deduce from the data the answers to those questions. In several instances, common fallacies and evaluation judgements that can bias conclusions will be taught.

Critical Thinking Outcome 2: Drawing on skills developed in class, students will be able to evaluate the validity of arguments, including their own. How to evaluated and think critically about the validity of their own data in all the laboratory modules, as well as examples from the literature of scientific dogma presented in lectures (and included on examinations) are taught. In particular, students will be taught how to read (from the literature) and create graphs and tables of data, including how that presentation of the arguments provides evidence for supporting or refuting a given hypothesis. In lecture, students will engage in several critical thinking points throughout the semester such as the hyperventilating patient, the sequence analysis puzzle, comparisons regarding structure and function, the interpretation of kinetic data to get modes of inhibition and deducing what that means for enzyme structure and function, as well as the effect of the nano-environments inside of proteins and how these change the chemistry.

Teamwork & Collaboration (TWC)

The teaching and implementation of teamwork and collaboration is key, actually critical, to BOTH semesters of the laboratory. Both semesters will teach the skills of proper teamwork and collaboration, and then allow students to act it out week after week, thus seeing the value in this skill. In the first semester, the basics of 2-3 person teams in constant support in performing the laboratory exercises are taught, performed, and evaluated. This skill is also taught in the first weeks and evaluated as a group at the end of the semester.

Teamwork Outcome 1: As a result of explicit training in teamwork and sustained experiences of collaborating with others, students will be able to identify the characteristics of a well-functioning team. In the first lecture each semester, and the first pre-lab discussion sections, successful teamwork strategies will be taught and emphasized as the only way to get through the laboratory exercises. Aspects of a well-functioning team are described and identified, as well as the lessons teamwork teaches; innovation, leadership development, and fostering knowledge of one's own strengths and appreciation for those of others. In addition, there it's explained that success in the laboratory will rely on effective collaboration with others, most importantly is the sustained interactions with their lab partner. All lab exercises are performed with a lab partner(s). Partners work closely the entire semester in preparation, performance, and analysis. The biochemistry laboratory aims to mimic a real-world situation wherein you have several overlapping objectives that all must be completed in the allotted four hours. This can only be accomplished if there is cooperation. Moreover, there are several exercises that require the cooperation among the pairs, so teams and tasks expand and contract during the semester. During the end of the semester, in the prelab discussion sections, an evaluation of how well the partners and teams worked together and what worked for success and what interfered with success will be included.

Teamwork Outcome 2: Students will demonstrate an ability to use the tools and strategies of working successfully with a diverse group, such as assigning roles and responsibilities, giving and receiving feedback, and engaging in meaningful group reflection that inspires collective ownership of results. How well teams function is assessed on a regular basis, as well as how well everyone functions as a member of that team. Teamwork is learned by performing all data collection and analysis working with a lab partner throughout the semester and with other groups at various points when data comparisons warrant. The ability to work successfully with diverse groups in which everyone may have different roles are integral to the laboratory's function. Final assessment of achieving this teamwork learning outcome, will include submission of both a self-evaluation and team-evaluation to their instructor at the end of the semester. The instructor will consider these evaluations in the context of the team contract when assigning final grades for teamwork, attitude, attendance, safety, and communication, all of which comprises 10% of their lab grade.

Tentative schedule:

Date	**Topic**	**Reading in Lehninger**	**Lab manual**
Week #1			
Tue. Sept. 3	Syllabus/introduction	Ch1	**Discussion begin/must attend**
Thur. Sept. 5	pH, noncovalent interactions, water	Ch2	
Week #2			Lab 1
Tue. Sept. 10	Amino acids, chirality	Ch3.1	
Thur. Sept. 12	side-chain properties, peptides and proteins	Ch3.1 – 3.3	
Week #3			Lab 2.1
Tue. Sept. 17	Protein primary structure/sequencing (1°)	Ch3.3 - 3.4	
Thur. Sept. 19	Protein purification/secondary structure	Ch4.1 - 4.2	
Week #4			No lab
Tue. Sept. 24	Protein higher order structure and folding	Ch4.3	
Thur. Sept. 26	Structure (CD, X-ray, NMR, cryo-EM), folding disease (brief) and catalysis introduction	Ch4.4 - 4.5 & 6.1	
Week #5			Lab 2.2
Tue. Oct. 1	**Exam I**		
Thur. Oct. 3	Review of kinetics, transition state theory and basic properties of enzyme catalysis	Ch6.2	
Week #6			Lab 2.3
Tue. Oct. 8	Steady state kinetics	Ch6.3	
Thur. Oct. 10	Enzyme mechanism example (acid/base)	Ch6.4	

Week #7			M-lab 2-3 discussion prerecorded Lab 3
Mon. Oct. 14	**No class (Indigenous People's day)**		
Tue. Oct. 15	**No class (substitute for Monday schedule)**		
Thur. Oct. 17	Enzyme mechanism example (metals)/inhibition, drug design	Ch6.4	
Week #8			Lab2.4
Tue. Oct. 22	Enzyme regulation	Ch6.5	
Thur. Oct. 24	Hemoglobin and allosteric regulation	Ch5.1	
Week #9			Lab 4
Tue. Oct. 29	Carbohydrates and chemistry	Ch7.1	
Thur. Oct. 31	Polysaccharides	Ch7.2	
Tutorial lecture on Central Dogma to make up the background for more chem related students.			
Week #10			Lab 5.1
Tue. Nov. 5	Introduction to nucleic acid, structure, supercoiling	Ch8.1 – 8.2, 24.2	
Thur. Nov. 7	**Exam II**		
Week #11			Lab 5.2
Tue. Nov. 12	PCR and some related biotechnology	Ch8.3, 9.1	
Thur. Nov. 14	Replication	Ch25.1	
Week #12			Lab 5.3
Tue. Nov. 19	Repair	Ch25.2-25.3	
Thur. Nov. 21	Transciption, RNA processing, translation	Ch26.1 – 26.2, 27.1	
Week #13			No lab
Tue. Nov. 26	Transciption, RNA processing, translation	Ch26.1 – 26.2, 27.1	
Thur. Nov. 28	**Thanksgiving break, No lecture**		
Week #14			No lab
Tue. Dec. 3	Lipids, membrane	Ch27.2	
Thur. Dec. 5	Lipids, membrane	Ch10.1 – 10.2	

Mid-term exams (last name A-M, SAR101; Last name N -Z, CAS 226)

Tue. Dec. 10	**Last day of the class Exam III**	
	Review session (TBA)	
Wed. Dec. 18	**Final exam** (3:00 – 5:00 PM) (To be adjusted based on registrar information)	