BIOSC 1470: Introduction to Biophysical Chemistry and Molecular Biophysics
Spring 2022

Class Period: Monday, Wednesdays, Fridays 9-9:45am.

Class Location: Whenever possible, this course will be taught in person in 169 Crawford Hall. As directed by the University, the course will online during the period of Jan10-26th. While the course lectures will be recorded until Jan26th , the expectation is that you will attend the lectures via Zoom synchronously.

Instructor: Andrew VanDemark
Contact: email: andyv@pitt.edu (this is by far the most effective method for getting ahold of me)
Phone: 412-648-0110

Risk Posture: This syllabus covers our operating procedure assuming a Guarded Risk level. If the University shifts to a different risk assessment level and we are required to hold class remotely, then class links for lectures will be extended for the appropriate amount of time. In this scenario, alternative testing plans will be disseminated to you in advance of the test.

Pre-requisites & Co-requisites

The following pre-requisites for the course include

- Foundations of Biology 2 (BIOSC 0160 or equivalent)
- Analytic Geometry & Calculus 2 (MATH 0230 or equivalent)

***Text*:** *Lecture materials will be provided to you*

Communication & Distribution of Information

In this course we will be using Canvas as the Learning Management System. Asynchronous lectures will be recorded using Zoom/Panopto. Synchronous course meetings will be via Zoom and recorded. **Tests will be administered in person**. You will be able to access all of these platforms for the course through Canvas. All course material outside of the lecture notes will be distributed to you via Canvas. I will communicate to you via Canvas or via email using your Pitt account. You will need to maintain a functional "pitt.edu" account.

Disabilities Resource Services

If you have a disability for which you are, or may be, requesting an accommodation, you are encouraged to contact both the instructor for this course and the Office of Disability Resources and Services, 140 William Pitt Union, 412-648-7890/412-624-3346 (Fax), as early as possible in the term. Disability Resources and Services will verify your disability and determine reasonable accommodations for this course.

Academic Integrity Policy

Cheating/plagiarism will not be tolerated. Students suspected of violating the University of Pittsburgh Policy on Academic Integrity, from the February 1974 Senate Committee on Tenure and Academic Freedom reported to the Senate Council, will be required to participate in the outlined procedural process as initiated by the instructor. A minimum sanction of a zero score for the quiz or exam will be imposed. View the complete policy at www.cfo.pitt.edu/policies/policy/02/02-03-02.html..

** The integrity of the academic process requires fair and impartial evaluation on the part of faculty and honest academic conduct on the part of students. To this end, students are expected to conduct themselves at a high level of responsibility in the fulfillment of the course of their study. It is the corresponding responsibility of faculty to make clear to students those standards by which students will be evaluated, and the resources permissible for use by students during the course of their study and evaluation. The educational process is perceived as a joint faculty-student enterprise which will perforce involve professional judgment by faculty and may involve—without penalty—reasoned exception by students to the data or views offered by faculty. Senate Committee on Tenure and Academic Freedom, February 1974

ACADEMIC INTEGRITY EXPECTATIONS:

Students are expected to do their own work. You may not work with another student (or anyone else). Any evidence of students colluding on tests or utilizing the work of others will constitute an academic integrity violation.

All assignments are assumed to be individual assignments unless explicitly stated otherwise by the instructor and stated in the instructions for the assignment.

The posting (either verbatim or paraphrased) of any assignment or examination, or subsection thereof, that is formally assessed for part of your course grade to online resources (such as Chegg) will constitute an academic integrity violation. It also may constitute a violation of US copyright law.

The access or utilization of any such online postings, even if you did not personally post them, also constitutes an academic integrity violation.

TURNITIN

Students agree that by taking this course all required assignments may be subject to submission for textual similarity review to Turnitin.com for the detection of plagiarism. All submitted papers will be included as source documents in the Turnitin.com reference database solely for the purpose of detecting plagiarism of such papers. Use of Turnitin.com page service is subject to the Usage Policy and Privacy Pledge posted on the Turnitin.com site.

OFFICE HOURS

I will hold two office hours

- Tuesdays 3:30-4:30pm: Virtual Office hours. There will be a link for these on the Canvas page. They will not be recorded.
- Wednesdays, right after class until 11am. These will be in-person at my office (360A Langley Hall).

GRADING AND POINT DISTRIBUTION

Grading will be on a 100 point scale where 94-100=A, 90-93=A-, 87-89=B+, 83-86=B, and so on.

You will be evaluated based on your performance on 5 tests and a cumulative final. Each will be 100 points. The final, also 100 points, will be cumulative. Tests will be taken in class and during the normal class period. Make-up exams will only be given under extenuating conditions and must be requested at least two days in advance. There will not be extra credit opportunities. **You will have the opportunity to drop your lowest score, but not the final. You cannot drop a 0 score.**

If you miss more than one test, you should discuss the options available to you with your advisor or the Dietrich School Undergraduate Dean's Office.

Important: Because of the ongoing pandemic and associated changes in teaching format, we will need to remain flexible with regarding to the testing format. The current syllabus contains the dates that I am intending on having exams. If we have to changes things for reasons outside of our control, then that's is what we'll do. I will give you adequate time to prepare for any test and change in testing environment. There will never be a surprise test!

COVID-19 SAFETY

In the midst of this pandemic, it is extremely important that you abide by public health regulations and University of Pittsburgh health standards and guidelines. While in class, at a minimum, this means you must wear a face covering and comply with physical distancing requirements; other requirements may be added by the University during the semester. These rules have been developed to protect the health and safety of all community members. Failure to comply with these requirements will result in you not being permitted to attend class in person and could result in a Student Conduct violation. For the most up-to-date information and guidance, please visit coronavirus.pitt.edu and check your Pitt email for updates before each class

CLASS CALENDAR:

We will use the following calendar for the course:

Date	Lecture#	Section	Topic	Test/Other
		Section 1	**Core Biophysical Concepts and Thermodynamics**	
Jan-10	1		Intro & background quiz CURE type survey? Overview of the course topics, define what Biophysics is	**Background quiz (online, no points)**
Jan-12	2		Biological building blocks, Protein, DNA, RNA, Lipid, Ions, Small molecules	
Jan-14	3		Molecular Interactions	
Jan-17			**MLK Day, No classes**	
Jan-19	4		Enthalpy	
Jan-21	5		Entropy	
Jan-24	6		Gibbs Free Energy	
Jan-26	7		Calorimetry: Measuring H, S, and G. DSC	
		In-person classes begins in Crawford 169		
Jan-28	8		Phase Diagrams, chemical potential, phase transitions	
Jan-31				**Test 1**
		Section 2	**Protein Structure and Molecular Interactions**	
Feb-2	9		Protein Structure, basics. Quantitative basis for protein stability, PTS assay.	
Feb-4	10		Protein Purification	
Feb-7	11		Protein Oligomerization, hydrodynamic radius, AUC	
Feb-9	12		Techniques: Chemical crosslinking, Native PAGE	
Feb-11	13		Protein Structure part2: X-ray crystallography and cryo-EM	
Feb-14	14		Protein Structure part3: NMR and computational techniques	
Feb-16	**15**			**Test 2**
		Section 3	**Protein-Ligand Interactions**	
Feb-18	16		Gibbs Energy Minimum and Equilibrium constants,	
Feb-21	17		Performing quantitative binding measurements	
Feb-23	18		Diffusion, Techniques (Anisotropy, Dynamic light scattering, equilibrium diffusion for ligand detection)	
Feb-25	19		Rate Constants for binding and Dissociation	
Feb-28	20		Cooperativity and Allostery, Hill equation, physical interpretation	
Mar-2	21		Ligands, metals, cofactors: Their impact on equilibrium measurements	
Mar-4				**Test 3**
Mar-7			**Spring Recess No Classes**	
Mar-9			**Spring Recess No Classes**	
Mar-11			**Spring Recess No Classes**	
		Section 4	**Enzyme mechanisms**	
Mar-14	22		Rate Constants	
Mar-16	23		Michaelis-Menten, Lineweaver-Burke, enzyme activity	
Mar-18	24	--	Enzyme Kinetics, 1st & 2nd order reactions	--
Mar-21	25		Activation energy and enzyme mechanisms	
Mar-23	26		Enzyme Inhibition	
Mar-25	27		Single Molecule Techniques: Detecting interactions with FRET	

Mar-28	28		Optical tweezers: Measuring the force of reactions	
Mar-30				**Test 4**
		Section 5	**Drug design**	
April-1	29		Types of drugs, general rules for drug design	
April-4	30		The complete drug design process	
April-6	31		Fragment libraries and SARs	
April-8	32		Computational methods in Drug design	
April-11				**Test 5**
		Section 6	**Biophysics in Action**	
April-13	34		Protein-membrane interactions	
April-15	35		Ion channels/Electrochemical gradients	
April-18	36			
April-20			Review Day—Bring your questions!!	
April-22				**Cumulative Final**

* *Topics for each day may be adjusted as we progress through the semester.*

However, the dates of the exams will not be altered if at all possible.