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## *BIOSC 1470: Introduction to Biophysical Chemistry and Molecular Biophysics Spring 2025*

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

**Class Location:** G-8 Cathedral of Learning

**Instructor:** Andrew VanDemark

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

**Office Hours:** Monday: 10-11am  
Tuesday: 3-4:30pm  
Wednesday: 10-11am  
Additional offices hours are available by request.

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### Pre-requisites & Co-requisites

The following pre-requisites for the course include

- Foundations of Biology 2 (BIOSC 0160 or equivalent)
- Biochemistry (BioSci 1000 or 1810)

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**Text:** *Materials and Notes will be provided in class*

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### COMMUNICATION & DISTRIBUTION OF INFORMATION

In this course we will be using Canvas as the Learning Management System. All course material outside of the lecture notes will be distributed to you via Canvas and through communication in-class. I will communicate to you via Canvas or via email using your Pitt account. **You will need to maintain a functional "pitt.edu" account.**

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### 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 accommodation for this course.

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### 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](http://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.

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#### GRADING AND POINT DISTRIBUTION

Grading will be on a 100 point scale where 93-100=A, 90-92=A-, 87-89=B+, 83-86=B, and so on.

The point breakdown will be as follows:

3 Exams (100points each)

1 Cumulative Final, 100points

Homework assignments, 100pts in total

If you miss one of the mid-terms for any reason, the missing score will be dropped from grade calculations. Note that the purpose of the dropped exam score is to accommodate missed exams. If you take all 4 tests, I will drop the lowest score. **Please be aware that there will be no make-up exams.** All students are required to take the comprehensive final.

**Once again, there are no make-up exams.** If you miss more than one mid-term exam you should discuss the options available to you with me, your advisor, or the Dietrich School Dean's Office. Any requests for a make-up for a second missed exam must be based on extenuating circumstances and either made well in advance and/or accompanied by complete documentation. Tests will be taken in class and during the normal class period. There will not be extra credit assignments (although I have been known to drop in an extra credit question into the tests on occasion).

You should always know where your grade stands. You can always ask me a question about your performance at any point throughout the semester and I will give you my best non-binding assessment of where I think you stand. I do not however, generate new assignments or extra credit with the goal of boosting one's grade at the very end.

Depending on what the scoring distribution looks like, I may choose to apply an upwards curve, boosting scores somewhat. Historically any curve has been relatively small (0-4 points). I will never curve the class down if the averages are high.

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### 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, I request that you comply with any physical distancing or masking requirements as directed by the University. 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](https://coronavirus.pitt.edu) and check your Pitt email for updates before each class.

Thank you in advance for your patience if anything needs to change.

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### CLASS CALENDAR:

We will use the following calendar for the course:

Date	#	Topic	
		<b><u>A practical guide to Core Biophysical Concepts and Molecular Forces</u></b>	
Jan-8	1	Intro & Overview of the course topics, define what Biophysics is. Biological building blocks, Protein, DNA, RNA, Lipid, Ions, Small molecules	
Jan-10	2	Intermolecular forces	
Jan-13	3	Protein Expression Systems, non-natural amino acid incorporation.	
Jan-15	4	Protein Purification, part 1: Affinity Chromatography	
Jan-17	5	Protein Purification, part 2: Ion and Hydrophobic Exchange	
Jan-20		MLK Day, No class	
Jan-22	6	Protein Purification part 3: Sizing Exclusion Chromatography	
Jan-24		No class	
Jan-27	7	Protein Stability, Protein Thermal Shift Assay	
Jan-29	8	Protein Oligomerization, hydrodynamic radius, light scattering	Homework 1 Due
Jan-31	9	Chemical crosslinking, Native PAGE	
Feb-3	10	Paper Discussion, Q&A exam prep	Paper using AA incorporation
Feb-5		<b>Test 1</b>	
		<b><u>Macromolecular Structure</u></b>	
Feb-7	11	Structure Visualization	
Feb-10	12	Protein Structure part 1: X-ray crystallography pt1	X-ray Structural paper assigned
Feb-12	13	Protein Structure part 2: X-ray crystallography pt2	
Feb-14	14	Protein Structure part 3: X-ray crystallography pt3	
Feb-17	15	Paper Discussion, Structural Analysis	Pymol Homework Due
Feb-19	16	Protein Structure part 4: Cryo-EM pt1	
Feb-21	17	Protein Structure part 5: Cryo-EM pt2	
Feb-24	18	AlphaFold 101	Homework 2 Due
Feb-26	19	Paper Discussion, Q&A Exam prep	
Feb-28		<b>Test 2</b>	
Mar-3		<b>Spring Recess, No classes</b>	
Mar-5		<b>Spring Recess, No classes</b>	

Mar-7		Spring Recess, No classes	
		<b><u>Binding Interactions</u></b>	
Mar-10	20	FRET	
Mar-12	21	Single Molecule techniques	
Mar-14	22	Equilibrium binding constants and performing quantitative binding assays	
Mar-17	23	Binding Assays 1: Diffusion techniques: Anisotropy, equilibrium dialysis,	
Mar-19	24	Binding Assays 2: Isothermal Titration Calorimetry	
Mar-21	25	SPR/Biacore	
Mar-24	26	MST	Homework 3 Due
Mar-26	27	Exam Prep	
Mar-28	28	Test 3	
		<b><u>Biophysics in Action</u></b>	
Mar-31		The complete drug design process	
April-2		Frontiers in Drug Screening: Using PTS, FA to screen libraries.	
April-4		Frontiers in Drug Screening: Crystallography with fragment-based libraries, and equilibrium dialysis.	
April-7		Frontiers in Drug Screening: Biological Drugs-Insulin	
April-9	32	Membrane-Protein interactions, Insulin-receptor	
April-11	33	Ion channels/Electrochemical gradients	
April-14	34	Flagella	
April-16		Flex Day	
April-18		Review Day—Bring your questions!!	
April-21		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.**