

BIBC 100
Winter Quarter 2024
CENTR 113
MWF 1:00 to 1:50 pm

Instructor: Matt Flagg, Ph.D.
mflagg@ucsd.edu

Office Hours: TBD HSS 1145L
Additional office hours available by appointment!

IAs: Yingyin (Katie) Li—yil097@ucsd.edu
Office hours: TBD

Kyle Iwata—kyiwata@ucsd.edu
Office hours: TBD

Zoom Discussion Sections

Fridays at 4:00 – 4:50 pm

Weekly Discussion Boards

Due Mondays by Noon

Weekly Quizzes

Due Mondays by Noon

Weekly Problem Sets

Due the Fridays by 11:59 pm

Self-Evaluations

Released after each class, due by the following class

Midterm 1

January 29th during class time, location TBD

Midterm 2

February 21st during class time, location TBD

Final exam

March 22nd from 11:30 am – 2:30 pm, location TBD

Communicating

We want to communicate with y'all in ways that are effective and sustainable.

I often make announcements on Canvas. Be sure you can receive them, please!

The Canvas discussion boards are your best resource for content-related questions. Especially if you post early in the week, you are quite likely to get several answers to your question. I read the discussion boards and respond to common questions in class.

Office hours are also a great time to ask *any questions*. We prioritize course content, but are happy to chat, too. There is no such thing as a “dumb” question.

Email is for questions that can be answered in one or two sentences. We'll respond between the hours of 9 am and 5 pm on weekdays. Please include “BIBC 100” in the subject line. If we don't respond within 24 hours, email again, please!

If we receive a more involved question via email, we will ask you to attend office hours or to schedule a Zoom meeting. Those options are better for everyone, *promise*.

Course Learning Outcomes

Upon completion of this course, you will be able to:

1. Identify enthalpic and entropic contributions to structural-biological processes.
2. Use thermodynamics to explain how and why macromolecular structures assemble from their constituent parts.
3. Use thermodynamic and biochemical principles to explain how a macromolecular structure support its function.
4. Use thermodynamic and biochemical principles to model non-allosteric and allosteric binding at the population level.
5. **Construct a flexible mental module of the macromolecular world that is grounded in biochemical and thermodynamic mechanisms.**

Course Materials and Tools

Textbooks

There are no required texts for this course. However, Lehninger's *Principles of Biochemistry* and Stryer's *Biochemistry* are both good resources. Keep in mind, however, that those texts cover topics outside our learning objectives.

Technology

The class will be podcast. Podcasts will be uploaded to our Canvas page.

iClickers will be used each class. Please be sure to bring one. You can use an iClicker or the mobile app, **but please choose one and use it every time!** The mobile app has a free trial, but it will expire by the end of the quarter!!

This quarter, iClicker has officially moved to iClicker cloud. Please, register [here](#) for iClicker cloud using your UCSD email address.

All discussion boards are on Canvas.

All quizzes are on Canvas.

Weekly problem sets and exams will be graded using Gradescope.

Grading Information

97-100%	A+
93-97%	A
90-93%	A-
87-90%	B+
83-87%	B
80-83%	B-
77-80%	C+
73-77%	C
70-73%	C-
60-70%	D

Assignment	Weight
Discussion Boards	10
Weekly Quizzes	10
Problem Sets	10
Lecture attendance	15
Self-evaluations	5
Midterm 1	15
Midterm 2	15
Final Exam	20
Total	100%

Grading Procedure

First and foremost, students in this class will NOT—in any way—be competing with one another for grades. I have no quotas for As, Bs, or Cs. I reserve the right to adjust the above scale, but any changes will always be in your favor. I will NOT make grading more stringent.

The midterms and final will be graded in a timely fashion. Grades will be posted on Canvas.

Exam Regrades

All requests for an exam regrade will be taken under hospitable consideration. I do regrades by meeting with students in-person individually. Please email me and propose a time for a 15-minute meeting. Zoom can be used in extenuating circumstances.

My aim is for regrade meetings to be friendly and productive for everyone, myself included. Tests are imperfect instruments. Learning and cooperativity are our priorities.

Please don't ask IAs for regrades. Doing so will be considered a breach of academic integrity.

Attendance, Excused Absences

In-person lecture attendance accounts for 15% of your final grade. These are basically "free" points, but I hope they make my emphasis clear: Our classroom and *your peers* are the most valuable part of this course.

Remote section attendance is optional. We'll post a link in the Canvas Zoom page. If you attend and participate, you can expect to fully grasp the problem sets. Exams reflect p-sets!!

Life happens. Y'all have jobs, get sick, etc. So, six absences from lecture will be excused without question. Absences for religious belief, observance, or practice will be accommodated.

Self-Evaluations

After each lecture, you will be asked to complete a brief self-evaluation on Canvas. These are graded for completion only. Self-evals offer a moment to pause and reflect. They are also a way for you to tell me about your efforts in the class, and to receive credit for doing so. I'm listening.

Discussion Boards

Meaningful participation on the discussion boards is required each week. You should do one of the following:

- 1) List a learning objective and ask a meaningful question about it.
- 2) Restate a quiz or problem set question and ask a meaningful question about it.
- 3) Respond to a classmate's question in a meaningful way.
- 4) List a learning objective and meaningfully demonstrate how *you* think about or do that learning objective. Do your best to avoid repeating what I say.

Late or Missing Assignments

Online quizzes and discussion boards will be due at the same time every week. Those due dates are listed on Canvas. If an extenuating circumstance arises, please contact me ASAP, and we can work on accommodations!

Crosscutting concepts in the course

These concepts will always be central to our conversations.

- Chemical bonds, both covalent and non-covalent
- Energy of intra- and inter-molecular systems
- Three dimensional structures and their spatial interactions

General Topics to be Covered

These topics will provide the context for using the crosscutting concepts above.

Molecular interactions and thermodynamics

- Entropy, conformation, and probability
- Enthalpy, charge, and electrostatic interactions
- Gibbs free energy and processes that proceed, net
- Structures that emerge from water chemistry and thermodynamics
- **A simple model:** thermodynamics when a process proceeds

Phospholipid-bilayer structure

- The hydrophobic effect
- Amphipathic molecules
- Structures that emerge from phospholipid chemistry and thermodynamics
- **Testing a simple model:** thermodynamics and temperature changes

DNA structure

- The basics of a biological polymer, the polynucleotide
- Structures that emerge from polynucleotide chemistry and thermodynamics
- The ways dsDNA structure supports its function

Protein structure and folding

- In-depth consideration of a biological polymer, the polypeptide
- Structures that emerge from polypeptide chemistry and thermodynamics
- The ways polypeptide structure supports binding
- **A simple model:** proteins are rigid, defined structures

Binding

- Entropy, enthalpy, and free energy at the population level
- Binding, rate constants, rates, and equilibrium
- The ways binding supports biological function
- **A simple case:** proteins that bind with one affinity
- **A deeper model:** thermodynamics when a process reaches or leaves equilibrium
- **Testing a deeper model:** thermodynamics and [ligand] changes

Allostery

- **A deeper model:** proteins are flexible, dynamic structures
- **A complex case:** proteins that bind with adjustable affinity

<p>Learning and Academic Support</p>	
<p><u>Ask a Librarian: Library Support</u></p> <p><i>Chat or make an appointment with a librarian to focus on your research needs</i></p> <p><u>Course Reserves, Connecting from Off-Campus and Research Support</u></p> <p><i>Find supplemental course materials</i></p> <p><u>First Gen Student Success Coaching Program</u></p> <p><i>Peer mentor program that provides students with information, resources, and support in meeting their goals</i></p> <p><u>Office of Academic Support & Instructional Services (OASIS)</u></p> <p><i>Intellectual and personal development support</i></p>	<p><u>Writing Hub Services in the Teaching + Learning Commons</u></p> <p><i>One-on-one online writing tutoring and workshops on key writing topics</i></p> <p><u>Supplemental Instruction</u></p> <p><i>Peer-assisted study sessions through the Academic Achievement Hub to improve success in historically challenging courses</i></p> <p><u>Tutoring – Content</u></p> <p><i>Drop-in and online tutoring through the Academic Achievement Hub</i></p> <p><u>Tutoring – Learning Strategies</u></p> <p><i>Address learning challenges with a metacognitive approach</i></p>
<p>Support for Well-being and Inclusion</p>	
<p><u>Basic Needs at UCSD</u></p> <p><i>Any student who has difficulty accessing sufficient food to eat every day, or who lacks a safe and stable place to live is encouraged to contact: foodpantry@ucsd.edu basicneeds@ucsd.edu (858) 246-2632</i></p> <p><u>Counseling and Psychological Services</u></p> <p><i>Confidential counseling and consultations for psychiatric service and mental health programming</i></p>	<p><u>Community and Resource Centers</u></p> <p><u>Office of Equity, Diversity, and Inclusion</u></p> <p><i>As part of the Office of Equity, Diversity, and Inclusion the campus community centers provide programs and resources for students and contribute toward the evolution of a socially just campus</i></p> <p>(858).822-.3542 diversity@ucsd.edu</p>

<p><u>Triton Concern Line</u> <i>Report students of concern: (858) 246-1111</i></p> <p><u>Office for Students with Disabilities (OSD)</u> <i>Supports students with disabilities and accessibility across campus</i></p>	<p><u>Get Involved</u> <i>Student organizations, clubs, service opportunities, and many other ways to connect with others on campus</i></p> <p><u>Undocumented Student Services</u> <i>Programs and services are designed to help students overcome obstacles that arise from their immigration status and support them through personal and academic excellence</i></p>
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Subject to Change Policy

The information contained in this course syllabus, other than the grade and absence policies, may be—under certain circumstances such as mutual agreement to enhance student learning—subject to change with reasonable advance notice.