

BCH 6740 – STRUCTURAL BIOCHEMISTRY

– Spring 2024 –

Class Time: Period 4, 10:40 - 11:30 am, on Monday, Wednesday and Friday (with exceptions)

Class Location: Room R3-265 located on the third floor above ground level in the Academic Research Building (<https://campusmap.ufl.edu/#/index/0201>). **Lectures will not be recorded.**

Course Coordinator: Thomas H. Mareci, Ph.D.

Instructors:

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Ramon Sun	ramonsun@ufl.edu	352-294-8407
Craig Vander Kooi	craig.vanderkooi@ufl.edu	352-294-8386

Office Hours: Contact individual instructors to arrange office hours.

Course Objectives: BCH 6740 is a 3-hour course presenting theoretical and practical aspects of structural biology and biophysical chemistry of biological molecules, and techniques for their study. The course is for graduate students and well-prepared undergraduates with interests in biochemistry, molecular and cellular biology, pharmacology, microbiology and cell science, chemistry, physics, plant sciences, and chemical engineering. Also, this course is one of the three core courses in the Department of Biochemistry and Molecular Biology. Advanced undergraduates may register with the permission of the course coordinator.

Prerequisites: Students should have completed undergraduate courses in chemistry and physics, or the equivalent, and organic chemistry or biochemistry are highly recommended as preparation for this course. Calculus is used throughout, so students should have completed a course in calculus or the equivalent.

Recommended textbooks and study materials: **Notes for all lectures are provided in UF eLearning.** Information about recommended books and study materials is provided by instructors. A useful reference book is the following: Physical Biochemistry, Principles and Application, 2nd Edition, Wiley-Blackwell publishers, 2009, by David Sheehan.

Class Attendance, Preparation and Make-up Exams: Class attendance is not required, but students who do not attend class will miss important classroom discussions. Students should come to class prepared to interact and ask questions. **Absence from scheduled exams is strongly discouraged.** Verifiable emergency or medical excuses are accepted, and a make-up exam will be arranged.
In-Class Recording

Students may record video or audio of class lectures in accordance with UF policy <https://aa.ufl.edu/policies/in-class-recording/>.

Grading: The grade is based on test scores for mid-term exam, which covers the first portion of the course, and the final exam, which covers the second portion of the course (see **Course Schedule** below). Grade points are assigned according to University policy (<https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies> and <http://handbook.aa.ufl.edu/teaching/policies>).

Accommodations for Students with Disabilities: Students with disabilities, who experience learning barriers and would like to request academic accommodations, should contact the Disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. Then students should share their accommodation letter and discuss their access needs with their instructor early in the semester

Online Course Evaluation: Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from **GatorEvals**, in their Canvas course menu under **GatorEvals**. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

Campus Resources:

Academic Resources

E-learning, <http://elearning.ufl.edu/>

Support, 352-392-4357 (select option 2) or e-mail helpdesk@ufl.edu.

Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with using the libraries or finding resources.

Teaching Center: 1317 Turlington Hall, 352-392-2010 or <https://umatter.ufl.edu/office/teaching-center/>. General study skills and tutoring.

Writing Studio: 2215 Turlington Hall, 352-846-1138 or <https://umatter.ufl.edu/office/writing-studio/>. Help brainstorming, formatting, and writing papers.

Career Connections Center: Reitz Union Suite 1300, 352-392-1601 or <https://career.ufl.edu/>. Career assistance and counseling services.

Student Complaints: <https://ombuds.ufl.edu/student>

Student Complaints On-Campus: [Visit the Student Honor Code and Student Conduct Code webpage for more information.](#)

On-Line Students Complaints: [View the Distance Learning Student Complaint Process.](#)

Complaints Filing Options: <https://hr.ufl.edu/manager-resources/employee-relations/employee-inquiry-and-complaint-procedures/complaint-filing-options/>

Health and Wellness

Your well-being is important to the University of Florida and the University is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. Please remember that asking for help is a sign of strength.

In case of emergency, call 9-1-1.

U Matter, We Care: <http://www.umatter.ufl.edu>

If you or a friend is in distress, please contact umatter@ufl.edu or Call 352-392-1575 so that a team member can reach out to the student.

Counseling and Wellness Center: <https://counseling.ufl.edu>
Phone 352-392-1575 for information on crisis services as well as non-crisis services.

Sexual Harassment: <https://hr.ufl.edu/forms-policies/policies-managers/sexual-harassment>

Sexual Assault: <https://police.ufl.edu/services/victim-services/sexual-violence-assault/>

Student Health Care Center: Call 352-392-1161 for 24/7 information to help you find the care you need, or [visit the Student Health Care Center website.](#)

UF Health Shands Emergency Room / Trauma Center: For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; [Visit the UF Health Emergency Room and Trauma Center website.](#)

University Police Department, 352-392-1111 (or 9-1-1 for emergencies).
<http://www.police.ufl.edu/>

Course Schedule

Lecture	Day	Date	Lecturer	Title
L-1	M,	1/8	Vander Kooi	Thermodynamics of protein biochemistry
L-2	W,	1/10	Vander Kooi	Practical protein structure: PDB and Pymol
L-3	F,	1/12	Vander Kooi	Experimental & computational approaches to structural biochemistry
	M,	1/15		No lecture (Rev. Dr. Martin Luther King Jr. Memorial Day)
L-4	W,	1/17	McKenna	X-ray crystallography: Crystallization and diffraction
L-5	F,	1/19	McKenna	X-ray crystallography: Bragg's law and the Fourier transform
L-6	M,	1/22	McKenna	X-ray crystallography: Phase problem and structural refinement
L-7	W,	1/24	McKenna	Neutron crystallography and how it differs from X-ray crystallography
L-8	F,	1/26	McKenna	X-ray free-electron laser and how it can be used in structural biology
L-9	M,	1/29	Mietzsch	Electron microscopy (EM)
L-10	W,	1/31	Mietzsch	Cryo-EM: Sample preparation and 2D-imaging
L-11	F,	2/02	Mietzsch	Cryo-EM: 3D image reconstruction
L-12	M,	2/05	Mietzsch	Cryo-EM: Applications
L-13	W,	2/07	Long	NMR: What's the frequency Kenneth? Detecting atoms by NMR
L-14	F,	2/09	Long	NMR: Chemical shifts, interactions, and basics of assigning proteins
L-15	M,	2/12	Long	NMR: Intermolecular interactions and chemistry in action
L-16	W,	2/14	Vander Kooi	AI-driven structure prediction
L-17	F,	2/16	Vander Kooi	Practical applications of AlphaFold
L-18	M,	2/19	Vander Kooi	Hydrogen deuterium mass spectrometry
L-19	W,	2/21	Bloom	UV/VIS absorption and CD spectroscopy
L-20	F,	2/23	Bloom	Fluorescence spectroscopy
L-21	M,	2/26	Bloom	Optical spectroscopy of protein-ligand interaction & enzyme reactions
L-22	W,	2/28	Bloom	Single-molecule approaches to studying macromolecules
	W,	2/28		Exam Review with instructors after L-22 at a time TBD
	Th,	2/29		Mid-term Exam, Thursday Evening, 6:00-8:00 pm, Room R3-265
L-23	F,	3/01	Mareci	Molecular Diffusion and Viscosity
L-24	M,	3/04	Bennett	Differential Scanning Calorimetry
L-25	W,	3/06	Bennett	Isothermal Calorimetry
L-26	F,	3/08	Bennett	Surface Plasmon Resonance and Biolayer Interferometry
	M-F,	3/11– 3/15		No lectures (Spring Break)
L-27	M,	3/18	Sun	Mass spectrometry as a tool for structural biochemistry
L-28	W,	3/20	Sun	Mapping spatial enzyme activity with mass spectrometry imaging
L-29	F,	3/22	McKenna	DNA structure and DNA binding structural motifs
L-30	M,	3/25	McKenna	RNA structure and RNA binding structural motifs
L-31	W,	3/27	McKenna	Icosahedral virus capsid assembly and structure
L-32	F,	3/29	Long	Lipid membranes
L-33	M,	4/01	Long	Membrane proteins
L-34	W,	4/03	Long	NMR: Examining protein – lipid interactions
L-35	F,	4/05	Long	Protein folding and “misfolding” mechanics
L-36	M,	4/08	Bloom	Oligomeric enzymes
L-37	W,	4/10	Bloom	Mechanoenzymes and motor proteins
L-38	F,	4/12	Bloom	Single-molecule analyses of DNA motor proteins
L-39	M,	4/15	Long	Protein Dynamics
L-40	W,	4/17	Long	NMR: Relaxation and measuring intrinsic protein dynamics
L-41	F,	4/19	Long	Intrinsically disordered and metamorphic proteins
L-42	M,	4/22	Long	Liquid/liquid phase separation
L-43	W,	4/24	Long	NMR: Protein structural biology of IDPs and metamorphic proteins
	F,	4/26		Exam Review with instructors during 4th period
	M,	4/29		Final Exam, Monday Evening, 6:00-8:00 pm, Room R3-265