



Chemistry 6750 Fall 2021
Principles of Structural Biology

Professor Sean J. Johnson

Time: We will meet Monday and Wednesday 8:15-9:30 am in Widt 330. See calendar for details.

Office Hours: By appointment (W237)

Text: There is no required text. All required materials will be provided in class. For additional reading, consider the following:

Liljas, et al., "Textbook of Structural Biology" – an overview of structural biology principles.

You should also have access to a general biochemistry textbook (Lehninger, Voet and Voet, Garrett and Grisham, etc) for review of fundamental biochemical principles. The course material will rely to a large extent on recent papers and review articles, which will be made available.

For those interested in crystallographic methods, a number of excellent textbooks are available. One of the most comprehensive texts is Bernhard Rupp's "Biomolecular Crystallography." Students are encouraged to talk to the instructor for more information.

Canvas: Course materials, including assignments and lecture notes will be available through the course Canvas page. This site is found at canvas.usu.edu. Username = banner ID; Password = banner pin. Only students who are registered for the class will have access to the course Canvas pages.

Computer Resources: Web-based and freely downloadable software (mac and PC compatible) will be required to complete course assignments and to prepare final presentations. All required software will be available on designated departmental computers.

Prerequisites: Chem 5700, or equivalent.

Provisions: The administration of Chem 6750 will adhere strictly to the regulations outlined in the Fall Semester Schedule of Classes.

Course content: Chemistry 6750 is a core course in advanced biochemistry for qualified students in chemistry, biochemistry, and biological sciences. This course is designed to introduce the principles modern structural biology. The objectives of the course include (1) understanding fundamental biological processes in terms of the atomic properties of the macromolecules that participate in them, and (2) understanding crystallographic methods. A tentative outline of the topics to be covered in the class meetings is included on the last page of the syllabus.

Description of Graded Assignments/Presentations:

Assignments –

Several assignments will be given throughout the semester to reinforce topics discussed in lecture.

Quizzes/Exam –

Quizzes: amino acid structures

Exams: structural principles, crystallographic methods; a final take home exam.

Model Building Assignment –

This project will be a major component of the course, and will take most of the semester to complete. The goal is to build a protein structure from scratch. Details will be given in class. Specific deadlines are indicated on the calendar.

Grading:

Assignments.....	65 points
Model building assignment.....	105 points
Exam/quizzes.....	140 points
Total	310 points

In accordance with the Americans with Disabilities Act, reasonable accommodations will be provided for all persons with disabilities in order to ensure equal participation in Chem 6750. In cooperation with the Disability Resource Center, reasonable accommodation will be provided for students with disabilities. Please meet with the instructor during the first week of class to make arrangements. Alternative format print materials, large print, audio, diskette or Braille, will be available through the Disability Resource Center.

#	date	Time	Pre-class assignment	Structural Biology topic	Structural Technique topic	Assignments/Quizzes	Model Building Project
1	Oct 11	M 8:15-9:30am	“Textbook of Structural Biology” pg 11-17	Overview Polypeptide chain & Handedness		Quiz – amino acid structures Coloring book	
	Oct 15	FALL BREAK					
2	Oct 18	M 8:15-9:30am	“Textbook” pg 17-21	Secondary structure - helices	Crystals and symmetry	Protein Data Bank - 50 th anniversary	Begin building protein backbone
3	Oct 22	F 8:15-9:30am		Secondary structure - helices	Waves and diffraction	Discovery of secondary structure	
4	Oct 25	M 8:15-9:30am	“Textbook” pg 22-23	Secondary structure - sheets	The phase problem	Diffraction Basics	Mainchain trace due (Wed). Get protein sequence
5	Oct 29	F 8:15-9:30am	“Textbook” pg 24-30	Secondary structure – loops, motifs	Solving the phase problem	Secondary Structure prediction	
6	Nov 1	M 8:15-9:30am	“Textbook” pg 31-36	Domains, Dynamics	Final structure / model quality	Structure Factor tutorial	
7	Nov 5	F 8:15-9:30am		Oligomers, Protein-protein interactions	Model Refinement		Sidechain building due
8	Nov 8	M 8:15-9:30am		Model Building			
Crystallography Exam – Nov 9-10 (testing center)							
9	Nov 12	F 8:15-9:30am			Cryo-EM		First refinement and molprobtity statistics due
	Nov 15	NO CLASS				Structure Search (Wed)	
10	Nov 19	F 8:15-9:30am			Structure Prediction		Final refinement and statistics due
	Nov 22	NO CLASS				Quaternary Structure	
Final – take home exam							