

Structural Biochemistry (CHM 4350, CHM 6351)

Number of credit hours: 3

Time: Tuesday/Thursday, 2:00 PM – 3:20

Location: PS-334

Instructor: Dr. Maciej Stawikowski
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PS-310
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Office Hours: Wednesdays, 2PM-3PM

Texts:

1. Introduction to protein structure; 2th edition, C. Branden & J. Tooze. ISBN-10: 0815323050. Recommended.
2. Introduction to Proteins: Structure, Function, and Motion; A. Kessel & N. Ben-Tal. ISBN-10: 1439810710. Recommended.
3. Lehninger Principles of Biochemistry; 4th edition, D. L. Nelson & M.M. Cox. ISBN-10: 0716743396. Recommended.
4. UCSF Chimera User's Guide.
<https://www.cgl.ucsf.edu/chimera/docs/UsersGuide/>
Recommended.
5. All online e-books freely available to FAU students and recommended by the instructor.

Prerequisites: CHM 2210, minimum grade of C and BCH 3033, minimum grade of C

Course description:

This course is an introduction to structural biochemistry with an emphasis on computer-based approach, hands-on experience to develop essential skills for understanding of relationships between structure and function of biomolecules. A workshop format (introductory lecture followed by hands-on practice) will be carried out throughout all sessions. Classes will be held in computer labs. Each session will be composed of approximately 45 min. of lecture and 45 min. of hands-on training.

Course objectives / learning outcomes:

We will use state-of-the-art software that will allow for visualization, manipulation and simulation of various biomolecules including proteins, nucleic acids, lipid membranes and their interactions. Students will learn how to identify and describe molecular interactions at different levels. We will work with different biological databases to obtain different data: from sequence to 3-dimensional structures. Participants will learn how use various computer programs to manipulate 3D structures, create publication-quality molecular images to be incorporated in scientific presentations and literature reports. State-of-the-art 3D printing technique will be incorporated into the teaching giving

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student better perspective on three-dimensional aspect of biomolecular architecture. During this course students will be involved in 3D printing of molecular models.

Course evaluation method:

Students will be required to practice the use of various programs and study given problems at home before class meets.

There will be three major exams during the semester: two progress exams (non-cumulative) and a comprehensive final exam. The comprehensive final exam is cumulative and may relate to any topic covered during the semester. The comprehensive final exam will be given during exam week at the end of the semester in accordance with the published FAU exam schedule.

The exam will consist of short answer questions (essay and word problems) and results of analysis of computer molecular models and biochemical problems. Software-relates skills may also be tested.

Each progress exam will be 60 minutes long while the final exam will be 90 minutes long. The exams will test the material covered in classes as well as material from assigned readings/practice problems.

Tentative exam dates:

Exam 1: Feb 15th (Thur)

Exam 2: March 22nd (Thur)

Final exam: May 1st (Tue)

Each exam will be held in PS 334, during regular class hours.

A student who misses any exam during the semester (or the final exam) will receive a grade of 0 unless a) student notifies the instructor prior to the exam that he or she will be absent and b) the student presents a legitimate, documented reason that meets FAU criteria for missing the exam. If these conditions are met, a make-up exam will be considered.

Any dispute concerning exam grades during the semester must be brought to instructor's attention within one week after grades are posted. No appeal will be considered at a later date.

ASSESSMENT AND GRADING SCALE

Final grade in this course will be calculated as a sum of points earned during exams and presentation:

Exam 1: 25 points

Exam 2: 25 points

Presentation: 15 points

Final exam: 35 points

TOTAL: 100 points

There will be no rounding.

No extra credit assignments will be given to an individual student as a means of improving the grade. Giving such credit is unfair to the rest of the class. Furthermore, a student who was not able to master the class material cannot be expected to successfully complete additional, higher level assignments.

All grades will be posted on Canvas.

Course grading scale:

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A	A-	B+	B	B-	C+	C	C-	D+	D	F
93.0-100%	89.0-92.9%	85.0-88.9%	82.0-84.9%	78.0-81.9%	74.0-77.9%	70.0-73.9%	67.0-69.9%	63.0-66.9%	60.0-62.9%	0-59.9%

Class policies:

- Attendance is required. Students must attend all scheduled sessions.
- Due to workshop course format there will be no make-up sessions offered.
- An excused absence requires appropriate documentation for either (1) participation in University approved activities or (2) health reasons.
- The final grade will be calculated as the sum of all exams, presentations and final exam.

Plagiarism policy:

Students are encouraged to work together to exchange ideas and engage in general discussion of their assignments and experimental results. However, all data is to be obtained on an individual basis. It is also required that data analysis and reporting are performed individually.

In the event that it is clear that data has been copied from another student, both students will receive a mark of zero on that exam, test, report or assignment.

Cheating:

Student cheating on an assignment or a lab report will receive a mark of zero on that assignment or report. Student cheating for the second time on an assignment or a lab report will receive an F for the course.

Make up exam will not be given unless a written and verifiable reason is approved either prior to the exam or within 24 hours of the exam date. Unexcused absence from an exam will result in a zero score being recorded. If a student is unable to complete the required coursework for health or family reasons, an incomplete may be issued.

Withdrawal:

Please check the official FAU website regularly for the most up to date information on last day to withdraw without a "W" & last day to withdraw without an "F" dates for this semester.

Incomplete Grade Policy:

Please refer to the FAU Undergraduate Catalog for the policy on "I" grades.

Disability policy statement:

In compliance with the Americans with Disabilities Act (ADA), students who require special accommodation due to a disability to properly execute coursework must register with the Office for Student Accessibility Services (SAS) - in Boca Raton, SU 133 (561-297-3880) – and follow all SAS procedures.

Honor Code policy statement:

Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty, including cheating and plagiarism, is considered a serious breach of these ethical standards, because it interferes with the University mission to provide a high quality education in which no student enjoys an unfair advantage over any other. Academic dishonesty is also destructive of the University

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community, which is grounded in a system of mutual trust and places high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. For more information, see University Regulation 4.001 at http://www.fau.edu/ctl/4.001_Code_of_Academic_Integrity.pdf

Anti-Discrimination and Anti-Harassment Policy:

Students, faculty and staff at Florida Atlantic University are expected to abide by the published anti-discrimination and anti-harassment policy:

<http://www.fau.edu/regulations/chapter5/Reg%205.010%206-2015.pdf>

Counseling and Psychological Services (CAPS) Center:

Life as a university student can be challenging physically, mentally and emotionally. Students who find stress negatively affecting their ability to achieve academic or personal goals may wish to consider utilizing FAU's Counseling and Psychological Services (CAPS) Center. CAPS provides FAU students a range of services – individual counseling, support meetings, and psychiatric services, to name a few – offered to help improve and maintain emotional well-being. For more information, go to <http://www.fau.edu/counseling/>

Class etiquette policy:

University policy on the use of electronic devices states: "In order to enhance and maintain a productive atmosphere for education, personal communication devices, such as cellular telephones and pagers, are to be disabled in class sessions."

- The use of cell phones or other communication devices for talking or texting is disruptive, and is therefore prohibited during class. A ringing or vibrating phone is just as bad, turn it off before class begins.
- Students are permitted to use personal computers during class for note-taking and other class-related work only.
- No food, drinks, chewing gums, snacks or similar items are permitted in class.
- Bringing-in visitors to the computer lab is not acceptable.

Class Schedule:

Below is the tentative schedule, which is subject to change due to environmental, pedagogical, or other factors deemed appropriate by the instructor.

Week	In Class	Exams/presentations
1	<i>Amino acids and protein primary structure. Introduction to UCSF Chimera software.</i>	
2	<i>Non-covalent interactions in biomolecules.</i>	
3	<i>Protein secondary structures.</i>	
4	<i>Protein tertiary and quaternary structure. Protein Domains and Motifs.</i>	
5	<i>Nucleotides and nucleic acids.</i>	Exam 1
6	<i>Carbohydrates and glycoproteins.</i>	

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	<i>Introduction to 3D printing of biomolecules</i>	
7	<i>Structure and organization of biological membranes. Membrane proteins.</i>	
8	<i>Biomolecular structure determination methods.</i>	
9	<i>Protein-protein interactions. Case studies.</i>	
10	<i>Protein-ligand interactions. Case studies.</i>	
		Exam 2
11	<i>Computational methods for structure prediction.</i>	
12	<i>Protein stability and dynamics.</i>	
13	<i>Biomolecular software – showcase and demonstration. Biological databases and data mining.</i>	
14	<i>Molecular structure description: analysis of literature examples; from writing to making molecular movies; creating stunning presentations; Practice examples.</i>	
		Presentations
	Final exam	Final exam

Required course materials:

USB flash drive – 16GB or more.