**Structural Biochemistry (CHM 4350)**

**Syllabus**

**Number of credit hours:** 3

**Time:** TBD

## **Location:** TBD

**Instructor:** Dr. Maciej Stawikowski

Department of Chemistry and Biochemistry

PS-55, PS310

Office Phone 561-297-4871

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**Office Hours:** TBD

**Texts:**

1. *Introduction to protein structure; 2th edition*, C. Branden & J. Tooze.

ISBN-10: 0815323050. *Recommended.*

1. *Introduction to Proteins: Structure, Function, and Motion;* A. Kessel & N. Ben-Tal. ISBN-10: 1439810710. Recommended.
2. *Lehninger Principles of Biochemistry;* 4th edition, D. L. Nelson & M.M. Cox. ISBN-10: 0716743396. Recommended.
3. *UCSF Chimera User’s Guide.*

<https://www.cgl.ucsf.edu/chimera/docs/UsersGuide/>

Recommended.

**Prerequisite:** CHM 2210, 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 1h of lecture and 2h 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 student better perspective on three-dimensional aspect of biomolecular architecture. During this course students will be involved in 3D printing of molecular models (upon availability of 3D printer).

**Course evaluation method:**

Students will be required to practice the use of various programs at home before class meets. Written and electronic reports along with the final exam are the basis for grading.

The exam will consist of short answer questions (essay and word problems) and results of analysis of computer molecular models/problems.

The grade in this course will be determined as follows:

7 written/electronic reports (70% total)

Final exam 30%

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 blackboard.*

**Course grading scale:**

|  |  |
| --- | --- |
| **A** | 93.0-100% |
| **A-** | 89.0-92.9% |
| **B+** | 85.0-88.9% |
| **B** | 82.0-84.9% |
| **B-** | 78.0-81.9% |
| **C+** | 74.0-77.9% |
| **C** | 70.0-73.9% |
| **C-** | 67.0-69.9% |
| **D+** | 63.0-66.9% |
| **D-** | 60.0-62.9% |
| **F** | 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.
* An unexcused absence will result in ‘zero’ points for the particular session.
* Students with 3 or more unexcused absences will automatically earn the “F” grade for the course.
* An excused absence requires appropriate documentation for either (1) participation in University approved activities *or* (2) health reasons.
* Written reports are due on a timely manner as requested by the instructor.
* Missing or past-due reports will result in ‘zero’ points.
* The grade will be calculated as the average of all class sessions and final exam result.

*Plagiarism policy:*

Students are encouraged to work together in the exchange of ideas and in general discussion of their assignments and experimental results. However, all data is to be obtained on an individual basis. It is also expected that the work of analyzing data and writing reports will be done individually.

In the event that it is clear that a report or 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 48 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.

***LAB 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.”

***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 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>

**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.

|  |  |  |
| --- | --- | --- |
| **Date/Week** | **In Class** | **Homework assignments** |
| 1 | Amino acids and protein primary structure. Introduction to UCSF Chimera software. |  |
| 2 | Non-covalent interactions in biomolecules. |  |
|  |  | Assignment - Report 1. |
| 3 | Protein secondary structures. |  |
| 4 | Protein tertiary and quaternary structure. Protein Domains and Motifs. |  |
|  |  | Assignment - Report 2. |
| 5 | Nucleotides and nucleic acids. |  |
|  |  | Assignment - Report 3. |
| 6 | Carbohydrates and glycoproteins. |  |
|  |  | Assignment - Report 4. |
| 7 | Structure and organization of biological  membranes. Membrane proteins. |  |
| 8 | Biomolecular structure determination methods. |  |
| 9 | Protein-protein interactions. Case studies. |  |
| 10 | Protein-ligand interactions. Case studies. |  |
|  |  | Assignment - Report 5. |
| 11 | Computational methods for structure prediction. |  |
| 12 | Protein stability and dynamics. |  |
|  |  | Assignment - Report 6. |
| 13 | Biomolecular software – showcase and demonstration. Biological databases and data mining. |  |
| 14 | Molecular structure description: analysis of literature examples; from writing to making molecular movies; creating stunning presentations; Practice examples. |  |
|  |  | Assignment - Report 7. |
|  | Final exam | Final exam |

**Required course materials:**

USB flash drive – 16GB or more.