CHEM 761: INTRODUCTORY CHEMISTRY

Instructor: **Dr. Ellinor Haglund**
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Office Hours: While I won't have set office hours for this course, I am generally available from 1 – 4 pm on Monday – Friday. Look for me in my office or lab (Room numbers above). Or if you prefer, email me for a specific appointment time.

Classroom: Bilger 242 **Hours:** Tuesdays and Thursdays 10:30-11:45 AM

Description of the topics discussed in this class: From a random coil to a fully folded and functional protein - dynamics, function, and disease

Molecular understanding of proteins and their structures are essential in understanding biological activity and function of proteins. This course discusses why proteins form specific structures, protein-protein interactions, and why errors sometimes occur as well as protective strategies against errors when folding goes wrong. When folding goes wrong in cells, misfolded and/or aggregated proteins may arise unable to perform their functions and sometimes even contribute to neurodegenerative diseases via amyloid formation. Diseases like Alzheimer's, Parkinson's and Amyloid Lateral Sclerosis are very serious proteinopathies without a cure. In addition to lectures and practical exercises, the course includes projects, discussions and a mini-conference and aims at improving the students' ability to formulate and test scientific hypothesizes.

Course Syllabus. This class will provide an in-depth knowledge for a better understanding of proteins biological function, and to be able to identify the role of the different steps in the folding process. It treats the interaction of proteins in the living cell at a molecular level as well as molecular mechanisms for protein diseases (proteinopathies). The course trains the ability to formulate and test hypothesis, computer-based methods such as for example basic bioinformatics.

The course includes the following elements:

1) A home exam (midterm) – Protein structures and PyMOL
2) Computer Assignments - Introduction to Molecular graphics programs (PyMol and VMD), and Molecular Dynamics (MD)
3) A mini conference with a poster presentation
4) Journal club with a presentation
5) A final exam

Material.

The computer graphics program PyMOL and VMD

Textbooks

Part 1: Introduction to protein structure, 2nd Edition by Brandén & John Tooze, 1999 ISBN 978-0-8153-2305-1

Part 2: Structure and Mechanism in Protein Science: A Guide to Enzyme Catalysis and

Protein Folding, Alan R. Fersht, **4th Reviced Edition**

I will also occasionally be handing out papers and photocopies of pages from other textbooks. If you miss a class, you will have to come by my office to get a copy.

Required reading: You will be expected to read about 30-50 pages from the textbooks as well as published work together with molecular graphics assignments using PyMOL each week. Since I can cover only the basic concepts in class, reading and practical tutorials using molecular graphics programs is critical for you to get something out of this course. Exam questions may be drawn from topics in the reading that were not discussed in class.

Expected results from the course. After taken this class the student is expected to:

- ✓ Understand the principles of protein motifs and protein folding
- ✓ Understand the interaction between proteins and co-cofactors and the relationship between protein misfolding and diseases
- ✓ Be able to formulate and test hypotheses regarding relevant issues in protein research
- ✓ Demonstrate proficiency in and understanding of the principles behind relevant laboratory techniques and computer-based methods for protein analysis

Lectures

The class will be taught with full size lectures, molecular graphics practice, individual or group project-based poster presentation (mini conference), a journal club of scientific papers, home exam, and a final exam.

Lecture Schedule: The schedule of topics will follow a routine where the first part of the class will be an introduction to molecular graphics, bioinformatics, and structural protein motifs following the topics of the book "Introduction to protein structure". The second part of the class we will go through parts of the book "Structure and Mechanism in Protein Science: A Guide to Enzyme Catalysis and Protein Folding" together with research articles in the topic of protein folding, misfolding/aggregation and proteinopathies. We may occasionally not have class on Tuesdays and Thursdays due to my travel schedule, but I'll upload reading material and recorded lectures on the Laulima website. Attendance is required.

Student papers and presentations: For the second part of the class, we will have a mini conference presenting a poster of a short project about protein folding (with and without the use of chaperones), or protein misfolding and proteinopathies. I can help you choose a topic if necessary. We will also have a journal club where we will present and discuss published work regarding different techniques to study proteins.

Exams

There will be two exams, the first part is a home-exam where you will have a week to finish the exam using books, published papers as well as the internet to answer questions about protein structures, bioinformatics and molecular graphics. The second part of the class will end with a final exam about protein folding and the biological function of proteins, as well as the molecular mechanisms for protein aggregation and diseases.

Course Policies:

- ✓ If you miss an exam and have a valid health-related excuse (note from hospital or doctor), then you can make-up the exam.
- ✓ Regular attendance is highly recommended. The aim of the lecture session is to highlight the basic concepts of protein motifs and the molecular mechanisms of protein folding based on my personal experience. You could learn much of this on your own from the textbooks, and the provided publications, but there may be a few topics that I cover in class that aren't in the textbook.
- ✓ Academic dishonesty will not be tolerated. Cheating in the form of copying, plagiarism, altering information, or using cribs or electronic aids on exams will result in judicial proceedings in accordance with the University of Hawaii Student Conduct Code

Grading

- ✓ Two exams (Home exam and Final exam) – Each worth 20%
- ✓ Journal Club with a PowerPoint presentation in small groups – 20%
- ✓ Poster presentation – 20%
- ✓ Homework – 20%
- ✓ Everything will be graded from 0 to 100. *No grading curve will be applied*. Final grade ranges will be:

A+ 95 – 100	B+ 80 – 84.9	C+ 65 – 69.9	D 45 – 54.9	F <= 44.9
A 90 – 94.9	B 75 – 79.9	C 60 – 64.9		
A- 85 – 89.9	B- 70 – 74.9	C- 55 – 59.9		

After each exam, I will post your exam and homework scores to Laulima and you will be able to see your current overall letter grade.

ACADEMIC MISCONDUCT

Plagiarism will not be tolerated. This includes plagiarism of journal articles and reviews, and also plagiarism of another student's work. If two lab reports contain essentially the same wording, we will assume the students worked together and both students will be penalized. Note that it is expected that lab partners will work together to collect data, analyze data, and discuss the results. However, each student must write their own separate report. Penalty: First offense, student will be asked to re-write the report without the offending material and will be given 1/2 credit if they do so. Subsequent offense: student will receive zero credit and the matter will be referred to the Department Chair and Dean for further action.

Likewise, cheating on an exam will be dealt with severely. A student will receive no credit for the entire exam, and the offense will be reported to the Department Chair and Dean for further action.