MCB 520 Graduate Biochemistry and CHE 346/CHE 541 Biomolecular Structure and Analysis, Fall 2014
Tuesday, Thursday 8:30-9:50 am 101 Javits

Course Directors: 
Daniel Raleigh (CHE 346/541) 
and 
Steven Smith (MCB520)

Office Hours: 
Mon 4:00-5:00 Thurs: 10:00- 11:00
Wed 12-1 pm, Thurs 3-4 pm

Office Hours:
Mon 3:00–4:00 pm, Friday
9:30–10:30 am

Office Hours:
Scott Laughlin (Chem 346/541/589)
Scott.Laughlin@stonybrook.edu

CHE 346/541 and MCB 520 meet jointly through the lecture on 10/28, at which point MCB 520 will diverge. CHE 346 & CHE 541 will continue to meet jointly.

Website: The course is on blackboard. This will be our only method of communicating outside of class. Please be sure your email addresses are updated and check for messages often. However, the lecture notes posted on blackboard are not a substitute for attending class and taking notes.

Prerequisites: Basic knowledge of organic and physical chemistry is assumed.

Textbook required: The Molecules of Life & Physical and Chemical Principles. Kuriyan, Konforti, & Wemmer (Two copies are on reserve in the Melville Library)

The following resources are also on reserve in the Chemistry Library.
Biochemistry, Voet & Voet
Nucleic Acids in Chemistry and Biology, G.M. Blackburn & M.J. Gait
Structure and Mechanism in Protein Science, A. Fersht
Introduction to Protein Structure, C. Brandon & J. Tooze
The Organic Chemistry of Biological Pathways, J. McMurray & T. Begley
The Organic Chemistry of Enzyme-Catalyzed Reactions, Silverman
Pushing Electrons, D. Weeks
Proteins, Creighton

Required Reading: We will assign some original articles and some review articles as required Reading. You will be responsible for any “assigned” articles. We will also recommend other articles for general interest and more information, they are optional. Copyright issues prevent loading all articles onto Blackboard. And we want you to get use to reading the literature and to become familiar with the Library resources!

NOTE ARTICLES ARE AVAILABLE ON LINE at The University Library Website and you can often find many at PubMed Central.
GO to the University Website:
Click on the Link to Libraries:
Click on the link to “ejournals”
Enter the name of the journal and then go to the article. You can download a PDF.
Exams & Grading: **There will be no make-up dates.** There is no final cumulative examination. However, given the basic nature of the material covered in the first and second midterms, you may very likely need to know the concepts and facts from the previous sections. The last Chem 346/541 exam will include questions from the entire course.

Midterm 1: September 30  
Midterm 2: October 30  
Midterm 3: December 9

MCB520, CHE541 and CHE346 are graded separately and Che346 students take different exams from Che541 students. The course is graded on a curve and the breaks are determined by the final scores. However, as a guide, the average +/- 1 standard deviation corresponds to a grade of B.

Chem-461/589

Weekly supplemental lectures are held on Friday mornings at 8:30 AM in Chemistry 128 for students registered in CHE461 and CHE589. A general review of the week's material will be covered. All Chem-346 students register for CHE 461.02 for 1 credit. Chem-541 Chemistry students register for CHE 589.02 for 1 credit depending upon placement exam scores. G3 and some G4 students can register for more than 12 credits. In certain cases, G4 students may register for 0 credits. See Katherine Hughes in the Chemistry main office for help.

MCB520:

There are no weekly supplemental lectures. If you have not covered the introductory course material in previous courses, then consider coming to Prof. Smith's office hours on either Wednesday or Thursday.

Learning Outcomes for MCB-520 and Chemistry 541

1. Students will develop a detailed knowledge of the building blocks of biological systems, including the structures of proteins, carbohydrates, nucleic acids, lipids and membranes.
2. Students will develop a quantitative understanding of how molecular structure directs function and the properties of biological molecules. Examples include, but are not limited to, how structure impacts pKa's, reactivity and binding.
3. Students will develop an understanding of how post-translational modifications impact protein function and how post translational modifications are generated.
4. Students will develop an understanding of the basic principles of molecular biology as used for the production of proteins and of protein purification.
5. Students will develop a quantitative understanding of the differences between thermodynamics and kinetics and the key principles of each discipline as applied to problems in biochemistry and biomolecular structure.
6. Students will be able to apply fundamental principles to the quantitative understanding of complex processes including ligand binding, allostery and enzyme kinetics.

Learning Outcomes for Chemistry 346

1. Students will become familiar with the building basic blocks of biological systems, including the structure of nucleic acids, lipids and membranes, simple carbohydrates and proteins.
2. Students will develop an understanding of how molecular structure directs the function and the properties of biological molecules. Examples include, but are not limited to, how structure impacts pKa's, reactivity, and binding.
3. Students will develop an understanding of how post- translational modifications impact protein function.
4. Students will develop an understanding of the basic principles of molecular biology and protein purification.
5. Students will develop a understanding of the differences between thermodynamics and kinetics and the implications for biomolecular function.
6. Students will be able to apply fundamental principles to the basic understanding of biological processes including ligand binding, allostery and enzyme kinetics.
DISABILITY SUPPORT SERVICES (DSS) STATEMENT
If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact Disability Support Services (631) 632-6748 or http://studentaffairs.stonybrook.edu/dss/. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential. Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and Disability Support Services. For procedures and information go to the following website: http://www.stonybrook.edu/ehs/fire/disabilities/asp.

ACADEMIC INTEGRITY STATEMENT
Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instance of academic dishonesty to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at http://www.stonybrook.edu/uaa/academicjudiciary/

CRITICAL INCIDENT MANAGEMENT
Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, and/or inhibits students' ability to learn.

Lecture Topics Schedule

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<td>Course introduction: Size, energy and time</td>
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<td>8/28</td>
<td>Protein structure &amp; function I: Basic amino acid structure</td>
<td>Raleigh</td>
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<td>9/4</td>
<td>Protein structure &amp; function II: Peptide bond properties</td>
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<td>9/9</td>
<td>Enzyme mechanisms I: Energy: pKa changes</td>
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<td>Enzyme mechanisms II: Time scales of catalysis, dynamics,</td>
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<td>Enzyme mechanisms III: Bacteriorhodopsin: size, energy</td>
<td>Smith</td>
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<td>9/18</td>
<td>Protein structure &amp; function III: Tertiary structure and</td>
<td>Laughlin</td>
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<td>9/23</td>
<td>Protein structure &amp; function VI: Protein folds, quaternary</td>
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<td>Ligand binding and equilibria</td>
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<td>Molecular specificity and affinity</td>
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<td>Midterm 2 (Covers lectures 9/25 – 10/28)</td>
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Date    Topic                                                                                     Instructor
11/4    Nucleic acids I: structure                                                             Scharer
11/6    Nucleic acids II: synthesis                                                            Scharer
11/11   Lipids and membranes I                                                                London
11/13   Lipids and membranes II                                                               London
11/17   Lipids and membranes III                                                              London
11/20   Molecular biology I                                                                   London
11/25   Molecular biology II                                                                  Laughlin
12/2    Nucleic acids III: recognition                                                         Scharer
12/4    Nucleic acids IV: repair                                                               Scharer
12/9    Midterm 3 11:15 – 1:45 pm - Javits 101                                               

MCB 520
Melville Library W4540

Date    Topic                                                                                     Instructor
11/4    Protein folding and misfolding                                                           Smith
11/6    Proteases                                                                               Glynn
11/11   Disordered polypeptides                                                                  Bowen
11/13   Post-transcriptional control of gene expression                                         Karzai
11/17   Post-transcriptional control of gene expression                                         Karzai
11/20   Cis-acting RNA elements                                                                  Czaplinski
11/25   Signal transduction, 7 TM receptors                                                      Smith
12/2    Signal transduction, Signal transduction, receptor tyrosine kinases                    Seeliger M
12/4    Ion channels                                                                           Wollmuth
12/9    Midterm 3 11:15 – 1:45 pm - Melville Library W4540                                      

CHE 346/541
Javits 101
Course Introduction: Size, energy and time
Chapter 1

Protein structure & function I: Basic amino acid structure and chemistry
Chapter 1B, 4

Protein structure & function II: Peptide bond properties and conformation
Chapter 4

Enzyme mechanisms I: Energy: pKa changes
Chapters 6-10

Enzyme mechanisms II: Time scales of catalysis, dynamics, diffusion
Chapter 17

Enzyme mechanisms III: Bacteriorhodopsin: size, energy and time
Chapter 4, 6-10

Protein structure & function III: Tertiary structure and fibrous proteins
Chapter 4

Protein structure & function VI: Protein folds, quaternary structure
Chapter 5

Ligand binding and equilibria
Chapters 12,13

Molecular specificity and affinity
Chapters 12,13

Enzyme kinetics I
Chapters 15,16

Enzyme kinetics II
Chapters 15,16

Allostery
Chapters 14

Post-translational modification
Chapter 14

Phosphorylation and kinases
Chapter 14

Carbohydrates
Chapter 3

Protein purification

Nucleic acids I: structure
Chapter 1,2

Nucleic acids II: synthesis
Chapter 1,2

Lipids and membranes I
Chapter 3,4

Lipids and membranes II
Chapter 3,4

Lipids and membranes III
Chapter 3,4

Molecular biology I

Molecular biology II

Nucleic acids III: recognition
Chapter 2,13

Nucleic acids IV: repair
Chapter 2

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Molecular biology II

Nucleic acids III: recognition
Chapter 2,13

Nucleic acids IV: repair
Chapter 2
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Chapter 11