BINF 6101/8101, Energy and Interaction in Biological Modeling
Syllabus (Spring, 2015)

Instructor: Jun-tao Guo
Contact: Office: Bioinformatics 359, Phone: 704-687-7492, Email: jguo4@uncc.edu
Office Hours: By appointment

Time and Location:
Tuesday and Thursday, 11:00-12:15pm
Bioinformatics 301

Textbooks:

Course Website: [http://bioinfozen.uncc.edu/BINF6101](http://bioinfozen.uncc.edu/BINF6101)

A) Course Description:
This course will cover: (a) the major organic and inorganic chemical features of biological macromolecules; (b) the physical forces that shape biological molecules, assemblies and cells; (c) the chemical driving forces that govern living systems; (d) the molecular roles of biological macromolecules and common metabolites; (e) and the pathways of energy generation and storage. Each section of the course builds upon the relevant biology and chemistry to explain the most common mathematical and physical abstractions used in modeling in the relevant context.

B) Pre/Co-requisites:
Prerequisite: permission of instructor

C) Learning Objectives:
Students will have an understanding of the fundamental molecular building blocks in biology and the physiochemical properties thereof, including:
- Know and understand the basic organic chemistry functional groups and their reactions.
- Understand chemical equilibria, and the thermodynamic interpretation thereof.
- Know and understand the basics of aqueous solutions, including how pH affects protein structure.
- Know and understand the fundamentals of biological macromolecular structure.
- Understand the basics of enzyme mechanisms, including transition state theory, and how to quantify enzyme kinetics.

D) Instructional Methods:
The course will be presented in a lecture format, which will include the following elements as appropriate: presentation of concepts and examples in a standard lecture format, interactive demonstrations of methods, and opportunities for student questions and discussion. Students who register for BINF8201 will present research papers in selected topics at the end of the semester.

E) Grading Plan:
Students will be evaluated based on their mastering of the materials taught in the class, and the ability to use them for solving practical problems. The grade is determined as follows:
Homework assignments, 30%
Mid-term exam, 25%
Final exam, 30%
Quizzes, 10%
Research projects/presentations and classroom participation 5%

Grades will be assigned on the following scale:
A=89-100% B=79-88% C=67-78% U=0-66%

F) Tentative Weekly Schedule:

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
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<tbody>
<tr>
<td>Week 1</td>
<td>Overview, the biochemical basis of life</td>
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<tr>
<td>Week 2</td>
<td>Water, acid/base and weak interactions</td>
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<td>Week 3</td>
<td>Amino acids</td>
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<td>Week 4</td>
<td>Protein structures (I)</td>
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<tr>
<td>Week 5</td>
<td>Protein structures (II)</td>
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<td>Week 6</td>
<td>Protein structure classification</td>
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<td>Week 7</td>
<td>Protein function: ligand binding</td>
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<td>Week 8</td>
<td>Review and mid-term exam</td>
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<td>Week 9</td>
<td>Spring break (3/2 – 3/6)</td>
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<td>Week 10</td>
<td>Carbohydrates and glyobiology</td>
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<td>Week 11</td>
<td>Nucleotides and nucleic acids (I)</td>
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<tr>
<td>Week 12</td>
<td>Nucleotides and nucleic acids (II)</td>
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<td>Week 13</td>
<td>DNA structure and protein-DNA interactions</td>
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<td>Week 14</td>
<td>Enzymes, thermodynamics vs. kinetics (I)</td>
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<tr>
<td>Week 15</td>
<td>Enzymes, thermodynamics vs. kinetics (II)</td>
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<td>Week 16</td>
<td>Lipid structure and membranes</td>
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<td>Week 17</td>
<td>Final review (4/28)</td>
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<td>Week 18</td>
<td>Final exam</td>
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G) Policy and Procedures:

1. Academic Integrity
All students are required to read and abide by the Code of Student Academic Integrity. Violations of the Code of Student Academic Integrity, including plagiarism, will result in disciplinary action as provided in the Code. Definitions and examples of plagiarism are set forth in the Code. The Code is available from the Dean of Students Office or online at: http://www.legal.uncc.edu/policies/ps-105.html. A set of links to various resources on plagiarism and how to avoid it is available at the UNCC Library website: http://library.uncc.edu/display/?dept=instruction&format=open&page=920.

2. Attendance
Attendance at lecture is required, although exceptions will be made for reasons such as illness or family emergency. Excessive absences will result in a reduced classroom participation score at the instructor’s discretion, and will negatively impact the overall course grade.