BB 482/582 BIOPHYSICS

INSTRUCTOR
Dr. Afua Nyarko
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CREDITS
3 credits

COURSE DESCRIPTION
Examines quantitative properties of biological systems and biological phenomena using concepts derived from mathematics and physics.

TIME AND LOCATION
MWF 13:00 – 13:50 via Zoom
Office Hours: By appointment

COURSE OBJECTIVES
Lectures and hands-on projects using a few important biophysical techniques for studying biomolecules and their interactions. Topics will cover the basic principles, and experimental design, with major emphasis on data handling and analysis.

LEARNING RESOURCES
Assigned readings and articles from the literature
Principles of Physical Biochemistry, 2nd Ed.” by van Holde, Johnson, and Ho (recommended)

PREREQUISITE
BB 481/581 (D- or better), CH440 (D- or better)

After completing this course, students will be able to

− Explain the key concepts for six biophysical techniques used to investigate biomolecular structures and interactions.
− Design appropriate experiments to investigate ligand-macromolecule interactions
− Critically evaluate and analyze primary literature using the selected biophysical techniques
− Analyze two and three dimensional NMR data and use the NMR visualization program SPARKY to sequentially assign protein backbone resonances

Additional Learning Outcomes for BB 582 graduate students

− Graduate students gain additional experience in critical analysis and problem solving skills through a literature-based term project.

Active interaction with peers and your instructor is essential to succeed in this course. Pay particular attention to the following:

• Review the readings and other instructional materials for each week and come prepared to participate in class discussions
• Be respectful to others and their opinions, valuing diversity in backgrounds, abilities, and experiences.
• Challenging the ideas held by others is an integral aspect of critical thinking and the academic process. Please word your responses carefully and recognize that others are expected to challenge your ideas. A positive atmosphere of healthy debate is encouraged.
• Students are expected to be on time and engaged fully in class discussions.

COURSE EVALUATION
Your grade will be based on the following scale:
A = 93-100%  A- = 90–92%  B+ = 87–89%  B = 83-86%  B- = 80–82%  C+ = 77-79%
C = 73-76%  C- = 70-72%  D+ = 67-69%  D = 63-66%  D- = 60-62%  F = below 60%

Your grade will be based on the distribution of points as follows:
**BB 482 and BB 582 Students:**
- a. Quizzes (5 total): 15%
- b. Presentation and discussion of primary research articles: 20%
- c. Completion of worksheets: 10%
- d. NMR-based project: 15%
- e. Take home exam (due at 6pm on Tuesday, March 16th, 6:00 pm): 40%

**BB 582 Students:**
- f. Term paper – graded as part of presentation (Due March 12th, 2020).

**Regarding Students with Disabilities:**
Accommodations for students with disabilities are determined and approved by Disability Access Services (DAS). If you, as a student, believe you are eligible for accommodations but have not obtained approval please contact DAS immediately at 541-737-4098 or at [http://ds.oregonstate.edu](http://ds.oregonstate.edu). DAS notifies students and faculty members of approved academic accommodations and coordinates implementation of those accommodations. While not required, students and faculty members are encouraged to discuss details of the implementation of individual accommodations.

**Student Conduct Expectations:**
Students are expected to adhere to the OSU Student Conduct Regulations described at [https://beav.es/codeofconduct](https://beav.es/codeofconduct)

**Reach Out for Success:**
University students encounter setbacks from time to time. If you encounter difficulties and need assistance, it’s important to reach out. Consider discussing the situation with an instructor or academic advisor. Learn about resources that assist with wellness and academic success at [oregonstate.edu/ReachOut](http://oregonstate.edu/ReachOut). If you are in immediate crisis, please contact the Crisis Text Line by texting OREGON to 741-741 or call the National Suicide Prevention Lifeline at 1-800-273-TALK (8255)

Behaviors disruptive to the learning environment will not be tolerated and will be referred to the Office of Student Conduct for disciplinary action.
Course schedule: This schedule is tentative and is subject to change to meet the needs of the class

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<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Monday</th>
<th>Wednesday</th>
<th>Friday</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>1/4 - 1/8</td>
<td>Assessment, Overview of course, biophysical techniques worksheet, BB582 students: Journal article (approved by 2/8)</td>
<td>Protein structure &amp; stability - Circular dichroism (CD)</td>
<td>Protein structure &amp; stability - Fluorescence spectroscopy</td>
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<tr>
<td>2</td>
<td>1/11 – 1/15</td>
<td>Thermodynamics, Stability and Interactions</td>
<td>Thermodynamics, Stability and Interactions ITC</td>
<td>Paper discussion</td>
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<td>Surface plasmon resonance (SPR)</td>
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<td>Quiz 1-CD &amp; fluorescence</td>
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<td>3</td>
<td>1/18 – 1/22</td>
<td>MLK day-no classes</td>
<td>Thermodynamic Stability and Interactions: ITC</td>
<td>Group 1: Paper presentation and discussion, Worksheet 1</td>
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<td>Homework: Watch ITC video</td>
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<td>Quiz 2: SPR &amp; ITC</td>
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<td>5</td>
<td>2/1 – 2/5</td>
<td>NMR experiments for protein backbone assignment</td>
<td>Download and install SPARKY - <a href="https://nmrfam.wisc.edu/nmrfam-sparky-distribution">https://nmrfam.wisc.edu/nmrfam-sparky-distribution</a></td>
<td>Group 5: Paper presentation and discussion (worksheet 5), Quiz 4: NMR</td>
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<td>Group work: protein backbone assignment</td>
<td>Group work: protein backbone assignment</td>
<td>Group 6: Paper presentation and discussion (worksheet 2),</td>
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<td>6</td>
<td>2/8 – 2/12</td>
<td>Group work: protein backbone assignment</td>
<td>Group 4: Paper presentation and discussion</td>
<td>Quiz 5: various techniques</td>
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<td>7</td>
<td>2/15 – 2/19</td>
<td>Miscellaneous techniques: Grad student-led presentations and discussions</td>
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<td>8</td>
<td>2/22 – 2/26</td>
<td>Miscellaneous techniques: Grad student-led presentations and discussions</td>
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<td>9</td>
<td>3/1 – 3/5</td>
<td>Miscellaneous techniques: Grad student-led presentations and discussions</td>
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<td>10</td>
<td>3/8 – 3/12</td>
<td>Spin labeling and Electron paramagnetic spectroscopy (EPR), Mass spec</td>
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<td>11</td>
<td>3/16</td>
<td>Take home exam due at 6 pm</td>
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