This course is designed to introduce DNA metabolism, with the emphasis on its role in maintaining genome stability and its relationship to human health and longevity. Special attention will be paid to the emerging field of single molecule enzymology. The course is heavily based on current and classic research literature. Students will be required to present and discuss research papers during the course. Grades will be based on students’ performance during quizzes and presentations and discussions of research papers.

Reading materials for the course will be available on the course web site on Desire-to-Learn.

Recommended textbook:
K. van Holde, Johnson, Ho “Principles of physical biochemistry”, Prentice Hall. 1998
Cantor and Schimmel “Biophysical Chemistry”

Prerequisites: CHEM 3653 and CHEM 3753 or equivalent

Objectives: learn the key biochemical mechanisms that underlie DNA packing and processing inside the cell, the role of genomic instability in human disease and the emerging single molecule approaches to studies of DNA packing and processing.

ESTIMATION OF GRADE

Grades will be calculated based on the student’s performance on a number of examinations, including quizzes, hourly exams and a final. The final will be cumulative, i.e. will contain information from the entire course. An estimated summary of examinations and their value is provided below. The grade structure will be revised if more tests will be administered.

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Quizzes/ Problem sets</td>
<td>150</td>
</tr>
<tr>
<td>Midterm Exam</td>
<td>100</td>
</tr>
<tr>
<td>Paper Presentation</td>
<td>100</td>
</tr>
<tr>
<td>Final</td>
<td>150</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>500</td>
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Lecture Schedule


Week 3 (Sep6/8). DNA size; Random coil; Global chromosome structure

Week 4 (Sep 13/15). DNA supercoiling; Stress-induced conformational transitions in DNA; Triplet expansion disease

Week 5 (Sep 20/22). DNA topoisomerases

Week 6 (Sep 27/29). Overview of single molecule methods: DNA elasticity

Week 7 (Oct 4/6). Structure of nucleosome; chromatin fiber; heterochromatin; Extensibility of chromatin.

Week 8 (Oct 11/13). Midterm

Week 9 (Oct 18/20). Chromatin and transcription; RNAPol; promoter; transcription factors; operators; genetic switch; RNAPol as a motor

Week 10 (Oct 25/27). Chromatin remodeling. Chromatin and longevity

Week 11 (Nov 1/3). Cell division and SMC proteins

Week 12 (Nov 8/10). DNA translocases

Week 13 (Nov 15/17). DNA motors in homologous recombination

Week 14 (Nov 22/24). Thanksgiving week

Week 15. (Nov 29/ Dec 1) FPALM

Week 16. (Dec 6/8) Review

FINAL EXAM:    MONDAY, DECEMBER 12, 2011 8:00 – 10:00 am

CODES AND POLICIES OF BEHAVIOR POLICY

Each student should acquaint her or his self with the Universities' codes, policies, and procedures involving academic misconduct, grievances, sexual and ethnic harassment, and discrimination based on physical handicap.

REASONABLE ACCOMMODATION POLICY

Any student in this course who has a disability that may prevent her or him from fully demonstrating his or her abilities should contact me personally as soon as
possible so we can discuss accommodations necessary to ensure full participation and facilitate your educational opportunities.

DISCLAIMER

The instructor reserves the right to change by addition and/or subtraction any and/or all materials contained in this syllabus. This includes, but is not limited to, course content, assignments, due dates, and portion(s) of the grade assigned to individual items within the course.