This is a Special Topics course designed to introduce metabolism of nucleic acids as seen by a biophysical chemist. The course discusses biophysical chemistry and topology of DNA as well as a host of single molecule methods and their biological applications with an emphasis on human disease. Biochemistry students will be able to enhance their knowledge of physical chemistry and learn cutting edge analytical tools involved in single molecule experimentation while students with background in physical and analytical chemistry will be introduced to various biological questions where new tools are needed. The course is heavily based on current and classic literature. Students will be required to present and discuss several 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 D2L.
Supplemental textbooks:
K. van Holde, Johnson, Ho “Principles of physical biochemistry”, Prentice Hall. 1998
Cantor and Schimmel “Biophysical Chemistry”,

Week 3 (Sep 4). DNA size; Random coil; Global chromosome structure
Week 4 (Sep 11). DNA supercoiling; Stress-induced conformational transitions in DNA; Triplet expansion disease
Week 5 (Sep 18). DNA topoisomerases
Week 6 (Sep 25). Overview of single molecule methods: DNA elasticity
Week 7 (Oct 2). Structure of nucleosome; chromatin fiber; heterochromatrin; Extensibility of chromatin.
Week 8 (Oct 9). Midterm
Week 9 (Oct 16). Chromatin and transcription; RNAPol; promoter; transcription factors; operators; genetic switch; RNAPol as a motor
Week 10 (Oct 23). Chromatin remodeling. Chromatin and longevity
Week 11 (Oct 30). Cell division and SMC proteins
Week 12 (Nov 6). DNA translocases
Week 13 (Nov 13). DNA motors in homologous recombination
Week 14 (Nov 20). Thanksgiving week
Week 15. (Nov 27) Super-resolution microscopy
Review

FINAL EXAM:    FRIDAY, DECEMBER 14, 2012 8:00 – 10:00 am

The instructor reserves the right to change by addition and/or subtraction any and/or all materials contained in this syllabus.

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