

# ECE/BIOM 680A1

## Methods in Nanoscale Biophysics- Syllabus

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**Meeting time and location:** Tuesday and Thursday 5:30 – 6:45 pm, ERC B301

**Course website:** <https://ramct.colostate.edu/webct/logon/1126924838111>

**Office hours:** Tuesday 10-11 or by appointment.

**Text:** There is no assigned textbook for this class. However, the following books cover much of the material in this class:

“Methods in Modern Biophysics” 2<sup>nd</sup> Edition by Bengt Nölting (Springer, 2006)

“Principles of Physical Biochemistry” 2<sup>nd</sup> Edition by K.E. Van Holde, C.W. Johnson, & P.S. Ho. (Prentice Hall 2006)

Research and review articles as well as handouts will be available in RamCT,

### **Other book recommendations:**

“Methods in Molecular Biophysics: Structure, Dynamics, Function” by Igor N. Serdyuk et al. (Cambridge University Press)

“Biological Physics: Energy, Information, Life” by Philip Nelson (Freeman, 2007)

“Molecular Cell Biology” 6<sup>th</sup> Edition by Harvey Lodish et al. (Freeman, 2007)

**Description:** This course focuses on the physics methods used in studying the conformations and dynamics of biological molecules and systems. The purpose of the course is to provide students with an understanding of the physics underlying the modern techniques used in biological and biomedical physics. Prior knowledge of calculus-based introductory physics and ordinary differential equations is required.

**Topics to be covered:**

- Introduction of the tools for macro-, micro and single-molecule measurements.
- Optical Spectroscopy: UV/visible absorption, IR, and Fluorescence.
- Electron microscopy: TEM and STEM.
- Scanning Probe Microscopy: AFM, STM, SNOM and SECM.
- Force spectroscopy: Optical and Magnetic Tweezers.
- Beyond the diffraction barrier: Superlocalization and Superresolution.
- Nanoelectrochemistry and molecular electronics.
- Nanopores and Nanochannels.

**Method of evaluation:**

Homework assignments (20 points): Five homework assignments from the materials in the textbooks and lectures will be given. The assignments will be due in two weeks. Each assignment is worth 4 points.

Mid-term Exam (20 points): The format of the mid-term will involve both conceptual short-answers and analytical calculations.

Term-Project (40 points): A term-project is required in this course. It involves a written term-paper of at least 4 pages (not including graphs and illustrations) and a 30-min oral presentation of the term-project. The topic of the project has to be closely related with the materials covered by this course and pre-approved by the instructor during the first month of the course.

Final Exam (20 points): A final exam will be given at the end of the course. It covers all the materials from the lecture and term-projects presented by the students.

**Grade Scale:** 100-A-90-B-80-C-60-D-50-F-0

**Students with disabilities**

The University is required to provide reasonable accommodations to students with disabilities, so as not to discriminate on the basis of that disability. Students with disabilities are encouraged to contact the instructors to discuss their individual needs for accommodations. Also, you may visit Resources for Disabled Students: <http://rds.colostate.edu/> or call them at (970) 491-6385.