

33-102: Concepts in Modern Physics, Spring 2005

Nanotechnology for Nonscientists

This course will explore the underlying science behind nanotechnology, the tools used to create and characterize nanostructures, and potential applications of such devices. Material will be presented using a minimum of mathematical description, but nevertheless emphasizing physical principles such as electric fields and forces, the nature of chemical bonds, interaction of light with matter, and elastic deformation of solids. Characterization using electron microscopy, scanning probe methods, and spectroscopic techniques will be described. Fabrication using *top-down* and *bottom-up* methods will be discussed in detail, contrasting these approaches and providing examples of each. Finally, examples of nanoscale components and systems will be described, including quantum dots, self-assembled monolayers, molecular computing, and others.

Grading for the course will be determined by fact-based homework assignments, quizzes and tests during the semester, and on a final project that each student will carry out on a topic selected in consultation with the instructor.

Textbooks:

Nanotechnology: A Gentle Introduction to the Next Big Idea, Mark Ratner and Daniel Ratner (Prentice Hall, New Jersey, 2003), ISBN 0-13-101400-5.

Understanding Nanotechnology, from the editors of Scientific American (Warner Books, New York, 2002), ISBN 0-446-67956-9.

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