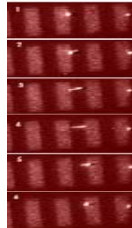
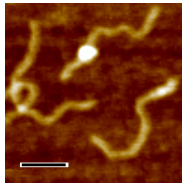


nm



What is Nanotechnology ?

One definition:

Engineering of materials and devices at scales that allow access to new length-dependent phenomena

In reality:

A collection of research areas with a common, unifying theme:

The control of matter and structures at the nanometer scale

The goal of this class:

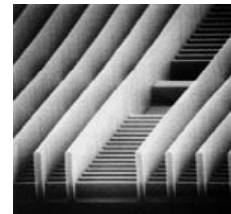
To provide a broad and wide-ranging overview of such fields

Contents of Class

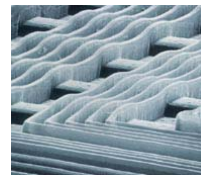
- I. Nanofabrication and Characterization
- II. Nanomaterials and Nanostructures
- III. Nanoscale and Molecular Electronics
- V. Nanotechnology in Integrative Systems
- VI. Nanoscale Optoelectronics
- VII. Nanobiotechnology

Note: Section IV of book will not be covered

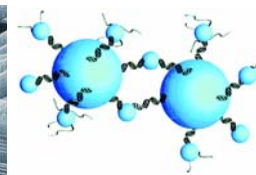
I. Nanofabrication/Characterization



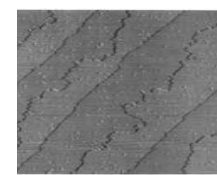
Will provide an overview of technologies that enable nanoscale research



Nanolithography



Self-Assembly

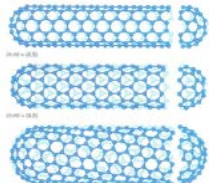


Probe Microscopy

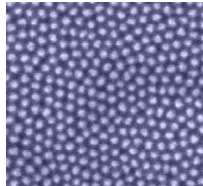
II. Nanomaterials and Nanostructures



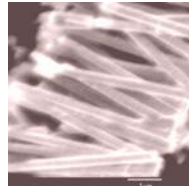
Will provide an overview of nanomaterials and nanoscale synthesis techniques



Fullerenes and Nanotubes

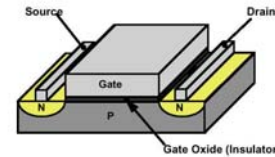


Quantum Dots



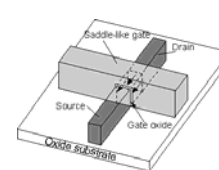
Nanocomposites

III. Nanoscale and Molecular Electronics

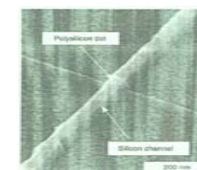


Challenges in electronic devices

Sustained need of smaller and faster electronics may require revolutionary approaches to device manufacturing



Nanoscale CMOS

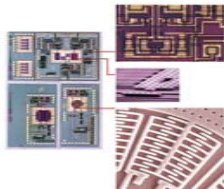


Single-Electron Systems



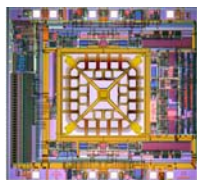
Molecular Electronics

V. Nanotechnology in Integrative Systems

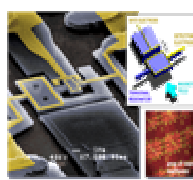


Challenges in microsystems

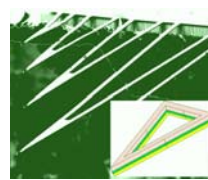
- complex architectures
- reduction of system size
- lower power consumption
- requires new "success" stories



Introduction to MEMS



Nanoelectromechanical Systems



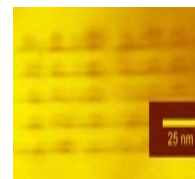
Micromechanical Sensors

VI. Nanoscale Optoelectronics

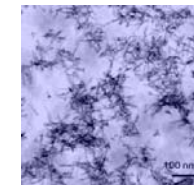


Challenges in optoelectronics

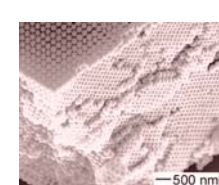
- device efficiency
- device tunability
- device integration
- novel materials for new applications



Quantum devices

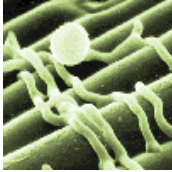


Organic Assemblies



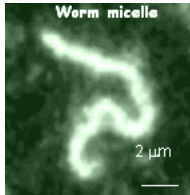
Photonic Crystals

VII. Nanobiotechnology

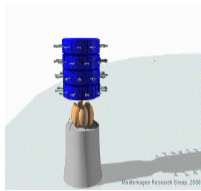


Challenges in biotechnology

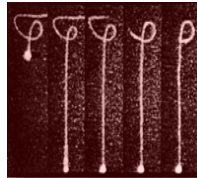
- understanding of natural nanosystems
- replication of nanosystems for novel device design



Biomimetic Nanostructures



Molecular Motors



Nanofluidics

Teaching Methodology

Class presents itself as overview of area with basic coverage of related fundamentals

The textbook has been designed around the pre-existing structure of the class

Class lectures designed as support of your independent reading, and explain the bigger picture of such research: attendance is NOT optional

Evaluation

6-7 Homework Assignments (40 %)
Designed to evaluate independent progress and class attendance

1 Midterm Exam (25 %)

1 Final Exam (35 %)