

An Overview of the Physics and Applications of Modern Nanoscience & Nanotechnology

INSTRUCTOR: Professor Nai-Chang Yeh

SCHEDULE: June 27, 2016 – July 8, 2016.

(Monday/Wednesday 9:00 AM – 12:00 PM; Friday 10:00 AM – 12:00 PM)

Course Outline:

I. Introduction

- The incipient of nanoscience and nanotechnology (nano-S&T).
- The scope and impact of modern nano-S&T.

II. Nano-Fabrication Technologies

- Top-down approaches, including photo-, electron-beam and focused-ion-beam lithography for inorganic materials and soft lithography for organic materials.
- Bottom-up approaches, including scanning-probe and “dip-pen” lithography, and self-assembly.

III. Nano-Characterization

- Overview of scanning probe microscopy.
- Principles and variations of tunneling microscopy.
- Principles and variations of force microscopy.
- Principles and variations of field microscopy.
- Hybrid microscopy.

IV. Nano-Materials/Structures

- Functional nano-materials.
- Nano meta-materials.

V. Nano-Devices

- Nano-electronic devices.
- Nano-photonic devices.
- Nano-electro-mechanical (NEM) devices.
- Nano-fluidic devices.

VI. Applications of Nano-S&T to Research Frontiers

- Applications to topics in condensed matter physics.
- Applications to quantum information technology.
- Applications to energy research.
- Applications to neuroscience.