

**Instructors:**

**Peter Hesketh** School of Mechanical Engineering  
**Zhito Kang**, School of Materials Science and Engineering  
**Christopher Summers**, School of Materials Science and Engineering

**Topics:**

Overview and Introduction (0.5 wk)
Properties of nanostructure devices (2 wks)
Physics of semiconductor nanostructures (2 wk)
Fundamentals and Methods for solid-state Nanofabrication (3 wks)
Nanodevice fabrication using Focused Ion Beams and Electron Beams (1 wk)
Nanodevice fabrication using Atomic Layer Deposition (1 wk)
Nanodevice fabrication by Electroplating (1 wk)
Fabrication of nanoparticle-based sensing devices by directed self-assembly (1.5 wk)
Epitaxial self-assembly of semiconductor nanostructures through MBE and MOCVD (1 wk)
Other fabrication techniques for semiconductor nanostructures (1 wk)
Nanodevice metrology and quality control (1 wk)
Term Project presentations and discussion (1 wks)

**Goals:**

To provide students with a introduction to fundamentals, applications and "top-down" fabrication of nanoscale devices for NEMS/MEMS, photonics, and sensors. It will cover ultrathin films, focused ion/electron/scanning probe patterning and lithography, electroplating and atomic layer deposition/epitaxy. Nanoelectronic and nanophotonic devices and sensors will be used as case studies. To better understand the need for nanostructures in optoelectronic and NEMS/MEMS devices there will be demonstrations showing how nanostructured devices can enhance device performance.

**Text Books:**

"Micro-Nanofabrication: Techniques and Applications" by Zheng Cui, Springer, 2009

**References:**

"Nanophotonics and Nanofabrication," M. Ohtsu, Wiley/VCH, 2009.  
 "The Physics of Micro/Nanofabrication (Microdevices)," by I. Brodie and J. J. Muray, Academic Press, 1993.

Lecture Time: TBD

Place: TBD

Grading: Homework: 10%  
 Exam I: 20%, Exam II: 20%, Final Exam 20%  
 Final Project and Presentation: 30%

Honor Code: <http://www.honor.gatech.edu>