

## Syllabus (v1)

### PHYS 539: Characterization and Fabrication at the Nanoscale

Introduction to study and creation of nanoscale structures, emphasizing relevant physical principles. Techniques covered include optical, X-ray, neutron, electron-based and scanned-probe characterization, low temperature transport, as well as patterning, deposition and removal of material.

#### Course Outline

**Characterization:** X-ray and neutron diffractions, electron microscopy, scanning probe microscopy, transport measurements, magnetic properties, optical properties,

**Conventional lithographic fabrication:** Thin film deposition, optical lithography, wet and dry etching techniques, electron beam lithography, focused ion beam lithography, X-ray lithography

**Unconventional lithographic fabrication:** Scanning probe lithography, interference or holographic lithography, step growth methods, nanoimprint lithography, soft lithography, near-field optical lithography, shadow masks, nanotemplates, nanosphere lithography, self-assembly, molecular lithography, chemical nanofabrication technique

#### Organization

##### Instructors:

Prof. Rui-Rui Du (transport, fabrication)

Prof. Pencheng Dai (scatterings, magnetic characterizations, optical methods)

**Grader:** Lingjie Du

**Lectures:** Tu Th 9:25 - 10:40 AM

**Homework** (70%)

**Term paper** (30% one term paper and presentation)

**Text:** Course notes