NFMT 311: 3 s.h.
Materials, Safety & Equipment Overview for Nanotechnology
Focuses on issues encountered in the practice of “top down” and
“bottom up” nanofabrication and the safe operation and maintenance
of nanofabrication processing equipment and materials-handling
procedures. Includes clean-room protocol, safety and environmental and
health issues in the nanofabrication facility at Penn State University. 2
hrs. lec., 2 hrs. lab. Coreq: NFMT 312. Completed at Penn State University
in State College during “Capstone Semester.”

NFMT 312: 3 s.h.
Basic Nanotechnology Processes
Hands-on introduction to the processing sequences involved in “top
down,” “bottom up” and hybrid nanofabrication. Details a step-by-step
description of processes to fabricate devices and structures. Stresses the
importance of environmental control (gas, liquid, vacuum) in processing.
2 hrs. lec., 2 hrs. lab. Prereq: Admission to the NFMT “Capstone Semester.
Coreq: NFMT 311. Completed at Penn State University in State College
during “Capstone Semester.”

NFMT 313: 3 s.h.
Thin Film Utilization
In-depth, hands-on exposure to depositing and etching a wide variety
of materials, including dielectrics, semiconductors organics, polymers,
metallic materials and molecular films. Students work in small teams and
develop oral and written reports. 2 hrs. lec., 2 hrs. lab. Prereq: NFMT 311
and 312. Completed at Penn State University in State College during
“Capstone Semester.”

NFMT 314: 3 s.h.
Lithography
Hands-on treatment of all aspects of advanced pattern transfer and
pattern-transfer equipment. Includes pattern-generation processes,
photolithography, particle beam lithographic techniques, probe pattern
generation and three types of lithography (embossing, stamp, self-
assembled). 2 hrs. lec., 2 hrs. lab. Prereq: NFMT 311. Completed at Penn
State University in State College during “Capstone Semester.”

NFMT 315: 3 s.h.
Materials Modification in Nanotechnology
Detailed coverage of material-processing steps for molecular
functionalization, cross-linking, metal silicidation, material oxidation,
materials nitridation, barrier materials, alloying, annealing and doping.
Includes avoiding unintentional materials modification via the use of
diffusion barriers, encapsulation, electromigration, corrosion, stress
effects and adhesion. 2 hrs. lec., 2 hrs. lab. Prereq: NFMT 311. Completed at Penn
State University in State College during “Capstone Semester.”

NFMT 316: 3 s.h.
Characterization, Testing Nanotech Structures & Materials
Examines a variety of techniques and measurements essential for
testing and for controlling final device performance and final packaging.
Problems and solutions concerning the interfacing of the macro-world
with micro- and nano-scale devices will be analyzed and examined. 2 hrs.
lec., 2 hrs. lab. Prereq: NFMT 311. Completed at Penn State University in
State College during “Capstone Semester.”