

PENNSTATE

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## Nanotechnology

**N**anoscale science and engineering is inherently interdisciplinary and bridges across engineering, materials science, physics, biology, and chemistry. It is a general-purpose, enabling technology. The National Science Foundation (NSF) states that nanotechnology “will affect almost all sectors of society. It will disrupt . . . markets, industrial organizations and business models.” The NSF, which is mandated with insuring the nation’s future scientific and engineering viability, also says that “50 percent of new products in advanced industrial areas will use nanoscale science and engineering by 2015.”

The nanotechnology minor is designed to help prepare students from diverse disciplines for careers in a broad range of industries innovating with nanotechnology. The minor builds on the singular strengths of Penn State’s nanofabrication facilities, including its class 1 and class 10 clean rooms, its faculty, and existing academic programs. The minor provides students with fundamental knowledge and skills in simulation, design, modeling, synthesis, characterization, properties, processing, manufacturing, and applications at the nanoscale.

As nanotechnology increasingly bridges across disciplines, a basic understanding of mathematics, physics, biology, and chemistry is recommended. The minor prepares undergraduate students to support major new nanotechnology research programs as graduate students. Interested third- and fourth-year students from related fields in engineering, the chemical, physical, and biological sciences, medicine, life, and agricultural sciences are encouraged to enroll.

### CAREER OPPORTUNITIES

Nanotechnology is already impacting a broad spectrum of human endeavors, from medicine and catalysis to textiles and quantum computing. The nanotechnology minor prepares students for career opportunities in these exciting fields. Opportunities lie in a variety of industries, including microelectronics, information storage, optoelectronics, photonics, pharmaceuticals, agriculture, and building products. The minor also prepares undergraduate students for multidisciplinary nanotechnology-based advanced degree programs in graduate schools around the world.

### PROGRAM REQUIREMENTS

Students must:

- Complete at least 18 credits in approved nanotechnology courses
- Take E SC 312 and E SC 313
- Take a minimum of 6 credits at the 400 level
- Achieve a grade of C or better in each course counted toward the 18-credit minimum

### SUPPORTING COURSES

- CH E 340 Introduction to Biomolecular Engineering
- E SC 419 Electronic Properties and Applications of Materials
- E SC 481 Elements of Nano/Micro-electromechanical System Processing and Design
- E SC 482 Micro-optoelectromechanical Systems (MOEMS) and Nanophotonics
- E SC 483 Simulation and Design of Nanostructures
- E SC 484 Biologically Inspired Nanomaterials

**This publication is available in alternative media on request.**  
Penn State is committed to affirmative action, equal opportunity, and the diversity of its workforce. U.Ed. ENG 07-94 (6/14/2007)