

# NANOENGINEERING (UNDERGRADUATE CERTIFICATE)

Nanoengineering is the study and implementation of techniques to work with small collections atoms and molecules at the "nano"-scale (i.e., 1-100 nanometers), at which new physical properties and phenomena emerge. The undergraduate nanoengineering certificate program of the College of Engineering is distinct from existing undergraduate programs in that students take courses toward this certificate program while pursuing their B.S. degree. Four courses plus a seminar course are required for completion of the certificate. This program offers nanoengineering courses that provide students with knowledge and hands-on experience in this newly developing field.

The Certificate Program's learning objectives include:

- To provide students in-depth training in nanotechnology and nanomedicine in one unified certificate program that crosses traditional departmental and disciplinary boundaries
- To increase students' knowledge in engineered materials, processes, and devices by linking less familiar nanoscale phenomena with more familiar bulk materials and phenomena
- To offer students hands-on laboratory training in nanotechnology
- To offer students research experience either in faculty labs or industrial labs
- To prepare students for a career in nanotechnology, high tech, and advanced manufacturing industries or research institutions
- To enable students to develop a strong multidisciplinary educational background to be competitive in a global economic environment
- To enable students to develop professional, communication, and teamwork skills that will widen their career options

**Admission Requirements** include current enrollment in a related bachelor's degree program or previous award of a related bachelor's degree. The program will be open only to:

1. current WSU undergraduate students who have completed at least sixty credits and have a g.p.a. of 3.0 or above; and
2. students who have previously earned a bachelor's degree at WSU or another accredited institution with a final cumulative g.p.a. of 3.0 or above.

Eligible students not currently enrolled at WSU may apply for direct admission to the program.

**Certificate Requirements:** Fifteen credits including all of the following courses:

Code	Title	Credits
NEN 5000	Introduction to Nanotechnology and Nanomedicine	4
NEN 5100	Nanoengineering Lab	2
NEN 5200	Scale-down Engineering - from Engineered Systems to Nanotechnology	4
NEN 5300	Nanoengineering Research and Capstone Design	4
NEN 5400	Nanoengineering Seminar	1
<b>Total Credits</b>		<b>15</b>

All students must earn at least a grade of B in each of the courses to be applied toward the certificate and complete all the coursework with

an overall g.p.a. of at least 3.0. Students concurrently enrolled in an engineering undergraduate program will be governed by the College's overall policy on substandard grades for students pursuing a B.S. degree. Students who have completed a B.S. degree and are pursuing only the certificate will be allowed one substandard grade, with a subsequent successful repeat of the course, during completion of the program.

## **NEN 5000 Introduction to Nanotechnology and Nanomedicine Cr. 4**

Basic understanding of nanomaterials synthesis, characterization, manufacturing methods, and their biomedical applications. Offered Winter.

**Prerequisites:** BE 1300 with a minimum grade of D- or BE 1310 with a minimum grade of D-

## **NEN 5100 Nanoengineering Lab Cr. 2**

Hands-on experience in the synthesis and characterization of nanomaterials, as well as device fabrication and biomedical applications. Offered Winter.

**Corequisite:** NEN 5000

**Course Material Fees:** \$100

## **NEN 5200 Scale-down Engineering - from Engineered Systems to Nanotechnology Cr. 4**

Basic understanding of scale-down engineering in a wide range of systems including sensors, drug delivery, manufacturing, electromagnetic materials, and imaging. Offered Fall.

**Prerequisites:** (BE 1300 or BE 1310) and NEN 5000

## **NEN 5300 Nanoengineering Research and Capstone Design Cr. 4**

Formulation and solution of open-ended research problems related to nanomaterials and nanotechnology using current methods, tools and principles of nano-engineering. Offered Winter.

**Prerequisites:** NEN 5000 with a minimum grade of D-, NEN 5100 with a minimum grade of D-, and NEN 5200 with a minimum grade of D-

## **NEN 5400 Nanoengineering Seminar Cr. 1**

State-of-the-art research in nanotechnology by attending seminars given by nationally and internationally prominent. Offered Fall, Winter.

**Prerequisites:** BE 1300 with a minimum grade of D- or BE 1310 with a minimum grade of D-