

ESTABLISHMENT OF A NANOENGINEERING UNDERGRADUATE CERTIFICATE PROGRAM

Recommendation

It is recommended that the Board of Governors approve the proposal from the College of Engineering for a Nanoengineering Undergraduate Certificate Program, effective winter term 2015.

Background

The College of Engineering proposes to establish a new undergraduate certificate program in nanoengineering. The proposed program will offer students in-depth training in the emerging technological area of nanotechnology by offering new lecture, laboratory, and seminar courses that cross traditional departmental and disciplinary boundaries.

Nanotechnology encompasses the development and utilization of functional materials, devices, and systems with novel properties and functions that are achieved through the control and structuring of matter at the atomic, molecular and macromolecular levels. Establishing fundamental knowledge at the nanoscale has been the main focus of the first decade of the National Nanotechnology Initiative (NNI), while the integration of basic knowledge and nanosystems to manufacture nanodevices for industry, medicine, and computing applications will be the goal for the 2020's.

The development of the certificate program is part of an ongoing effort at Wayne State University, in response to the NNI, to establish a multidisciplinary Center of Excellence in nanotechnology and nanomedicine, which culminates in an award from the National Science Foundation titled "NUE: Development of an Undergraduate Certificate Program in Nanoengineering for Training the Workforce of Tomorrow." The proposed undergraduate training program represents a natural next step for institutionalizing research and teaching in nanotechnology by faculty members who have collaborated with each other in research and education. The existing institutional support, research network, and research infrastructure will enable rapid integration of nanoengineering research into undergraduate education at Wayne State University.

The nanoengineering certificate program is expected to fulfill the educational needs of working engineers and technical professionals, targeting especially those in the Metro Detroit area and Windsor, Canada. This is expected to positively impact the local economy as many professional workers in the manufacturing industry are historically vulnerable to economic fluctuation. The specific objectives of the program are consistent with Michigan's goal of moving from a manufacturing-based economy to a more knowledge-driven economy. The certificate program has partnered with companies to provide innovative course contents (for example, in energy generation and storage, flexible sensors, and biomaterials), internship and research opportunities, team-work, communication, and other relevant skills to significantly improve our students' employability.

Program Description

The undergraduate nanoengineering certificate program will be distinct from existing undergraduate programs in the College of Engineering and the Department of Chemical Engineering and Materials Science. Students will take new courses toward this certificate program while pursuing their B.S. degree. Four new courses plus a seminar course will be required for completion of the certificate. The first course (Introduction to Nanotechnology and Nanomedicine) was taught in winter 2013 and winter 2014. The existing Nano@Wayne seminar series will be incorporated as the seminar course. The certificate program will offer new nanoengineering courses that provide students with knowledge and hands-on experience in nanotechnology.

The Certificate Program's learning objectives include:

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

Admission Requirements

Undergraduate certificates will be awarded upon the completion of the concurrently pursued and related bachelor's program or upon completion, if the bachelor's degree has been previously awarded. The program will be open only to: 1) current WSU undergraduate students who have completed at least 60 credit hours and have a GPA 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 GPA of 3.0 or above. Eligible students not currently enrolled at WSU may apply for direct admission to the program.

Curriculum Requirements

All of the following are required courses for the certificate program (15 cr.):

- NEN 5000 Introduction to Nanotechnology and Nanomedicine (4 cr.)
- NEN 5100 Nanoengineering Laboratory (2 cr.)
- NEN 5200 Scale-down Engineering: from Engineered Systems to Nanotechnology (4 cr.)
- NEN 5300 Research and Capstone Design (4 cr.)
- NEN 5400 Nano@Wayne Seminars (1 cr.)

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 GPA 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 NUCP will be allowed one substandard grade, with a subsequent successful repeat of the course, during completion of this program.

Graduation Requirements

All coursework must be completed in accordance with Wayne State regulations governing undergraduate scholarship and degrees.

Program Administration

The certificate program will be administered jointly by the Director of the Nanoengineering Certificate Program (G. Mao) as well as a steering committee consisting of core nanoengineering faculty members from the departments of Chemical Engineering and Materials Science (S. da Rocha, E. Nikolla), and Electrical and Computer Engineering (M. Cheng, Y. Xu). This committee will meet regularly to oversee the program.

Federal Student Aid Eligibility

The program is not seeking Title IV federal student aid eligibility. For the student simultaneously pursuing an undergraduate degree, there will be no need to pursue financial aid eligibility for the certificate program. For the student who already has a degree and plans to pursue only the certificate, we do not foresee a need for such students receiving financial aid for the certificate program only.

Budget and Resource Requirements

A \$200,000 National Science Foundation grant (NSF EEC Award # 1343703) will be used toward the purchase of materials and supplies and a part-time support technician. The College of Engineering will provide faculty, graduate teaching assistants, and laboratory space for the program. The Dean has committed the following support:

- Faculty assigned to teaching the nanoengineering courses are: Guangzhao Mao for NEN 5000, Mark Cheng and Yong Xu for NEN 5100, Eranda Nikolla for NEN 5200, Sandro da Rocha for NEN 5300, and Guangzhao Mao for NEN 5400.
- GTA’s: 2 GTA’s will be committed to the NEN 5100 Lab.
- Laboratory space: the NEN 5100 lab will share the lab space with the BE 1310 lab currently being renovated. The lab is located in Room 1335, College of Engineering Building.

Accreditation

Not applicable. ABET does not accredit certificates.

Approvals

The proposal was approved by the faculty and Chair of the Department of Chemical Engineering and Materials Science, the Academic Operations Committee of the College of Engineering, the faculty of the College of Engineering, the Dean of the College of Engineering, and the Provost's Office.