

Project Summary

NUE: A Nanotechnology Certificate Program for Engineering Undergraduates

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We propose to create, implement, and evaluate an interdisciplinary Nanotechnology Certificate Program in the College of Engineering at the University of Wisconsin-Madison (UW) through this Nanotechnology Undergraduate Education (NUE) project. This will involve several steps:

- 1) create new course modules to modify existing courses on NSET,
- 2) institutionalize several existing special topics courses with NSET focus,
- 3) develop and institutionalize newly proposed courses required for the Nanotechnology Certificate: *Introduction to Nanotechnology and its Societal Implications* and *Nanotechnology Seminar: Analysis and Impact*;
- 4) train graduate student interns and faculty in developing and assessing new nano-oriented case studies for simulation-based active learning instructional materials,
- 5) create a mechanism for training undergraduate engineering and physical science students at our institution in NSET,
- 6) implement and institutionalize a Nanotechnology Certificate at the University of Wisconsin – Madison, and
- 7) disseminate the results of the project, including syllabi, instructional materials, certificate requirements, and assessment results of the effectiveness of the products created.

Intellectual Merit: The proposed project of creating a Nanotechnology Certificate Program advances knowledge and understanding in nanoscale science, engineering, and technology (NSET) by increasing the presence of NSET in the undergraduate classroom and by establishing a formal pathway through which undergraduates can obtain a fundamental understanding of concepts critical to nanotechnology. Several existing courses will have NSET components integrated into their syllabi, a strategy that will affect all students enrolled in those courses, not just those completing the Nanotechnology Certificate. The two newly developed courses, *Introduction to Nanotechnology and its Societal Implications* and *Nanotechnology Seminar: Analysis and Impact*, will advance Nanotechnology Certificate students' understanding of NSET by introducing them to the field and demonstrating the fundamental connections among disciplines at the nanoscale through case studies. The undergraduate students who complete the Nanotechnology Certificate, and also those who take the nano-enhanced courses, promise to advance our future knowledge and understanding of NSET when they enter the workforce and/or begin graduate studies.

Broader Impacts: The proposed Nanotechnology Certificate Program promotes teaching of nanoscale science, engineering, and technology (NSET) topics by integrating them into pre-existing courses and creating two new courses dedicated solely to them. Through the proposed Delta graduate student internship in course planning and assessment, both graduate students and faculty will benefit from training in creating effective educational materials. And by making the certificate program open to all College of Engineering and physical science undergraduates at the BS level, which is also a critical education level for companies invested in nanotechnology development, a broad and diverse range of students will benefit from NSET education. The proposed Nanotechnology Certificate offers formal training in NSET topics to students and formal acknowledgement of this training with their Bachelors of Science degree.