GRADUATE CERTIFICATE
PROGRAM IN ENGINEERING NANOTECHNOLGY

Washington State University

School of Mechanical and Materials Engineering

1. Statement of Need

Nanotechnology is the vanguard of a revolution in technology and industry. Fundamental nanoscale processes, nanomaterials, nanoscale devices and systems, and instrumentation for nanotechnology have been identified as key component areas by the National Nanotechnology Initiave. This certificate program will provide a suite of classes that will offer a focused and comprehensive emphasis in engineering nanotechnology.

The targeted students for this certificate program are either working professionals who wish to develop expertise in this emerging technology to advance their careers, or, graduate students who wish to have an emphasis in this area.

2. Admission Requirements

A prospective student must have received a baccalaureate degree from a college or university accredited by a recognized accrediting association. The applicant must apply and be admitted to the Graduate School, fulfilling all the requirements and standards of regular students.

Students Students will be admitted as “Not-Advanced-Degree-Candidates” (NADC), as defined by the Graduate School, and may only accumulate 9 credits.

3. Statement of Resources

The Engineering Nanotechnology Certificate Program primarily draws upon the existing resources of the School of Mechanical and Materials Science Engineering. The participating faculty members hold appointments in the school. All facilities and equipment are associated with the school.

We expect this program to be desirable to students who are working professionals; for example, from the Tri Cities and PNNL. Each semester there will be one course offering from the certificate program available on the AMS system and/or on streaming video.

4. Description of Curriculum

This certificate program will address the following key component areas identified in the National Nanotechnology Initiative

- Fundamental nanoscale phenomena and processes
- Nanomaterials
- Nanoscale devices and systems
- Instrumentation for nanotechnology

To obtain the certificate students must complete a minimum of nine credits from the following list of courses. Courses taken under the certificate program will be graded. No S/F courses will be used or counted for the certificate. Courses in which a grade of B or less are obtained may not count towards completion of the requirements. All academic standards will conform to Graduate School Policy.

ME 509 MEMS Engineering 3. Prereq graduate standing or instructor's permission. Introduction to the design fabrication and application of microelectromechanical and nanoelectromechanical systems

ME 526 Microscopic Thermodynamics 3 Microscopic development of equilibrium; classical and quantum particle statistics; statistical description of real and ideal gases, solids, and liquids.

ME 520 Multiscale Modeling in Thermomechanics of Materials 3 Introduction to multiscale problems in thermomechanics of materials; practical and computational aspects of homogenization, granular materials, dislocation plasticity, atomistic methods.

MSE 517 Thin Films 3 Prereq graduate standing or senior in engineering or science. Materials science aspect of thin films, including growth, characterization, and properties for electrical, mechanical, corrosion, and optical behavior.

MSE 506 Biomaterials 3 Prereq graduate standing or instructor's permission. Overview of the different materials used in biomedical applications such as implants and medical devices

MSE 592 Transmission Electron Microscopy 3 Development of the principles and applications of electron optics in microscopy.

5. List of Faculty

Certificate faculty will be drawn from the faculty in the School of Mechanical and Materials Science Engineering. Short biographical sketches of participating faculty are below.

Sinisa Mesarovic, Associate Professor; with WSU since 2001; Ph.D. in Engineering Sciences from Harvard University in 1996; specialties: mechanics and physics of materials, as well as mathematics and computations, nonlinear dynamics, fracture mechanics, plastic instabilities, dislocation mechanics, contact mechanics and powder metallurgy.

Cecilia D. Richards, Professor; with WSU since 1992; Ph.D. in Mechanical Engineering from University of California at Irvine in 1990; specialties: : MEMS power, microfluidics, spray combustion, two-phase flows, air breathing engines.

Robert F. Richards, Professor; with WSU since 1992; Ph.D. in Mechanical Engineering from University of California at Irvine in 1990; specialties: heat transfer, thermodynamics, micro-electro-mechanical systems (MEMS).

Susmita Bose Associate Professor; with WSU since 2001; Ph.D. in Physical-Organic Chemistry from Rutgers University in 1998; specialties: Nano structured materials, Biomaterials; Ferroelectric thin and thick films for MEMS; Synthesis and characterization of organic and inorganic compounds; Processing of porous ceramic, polymer and composites using Rapid prototyping

David Bahr Professor; with WSU since 1997; Ph.D. in Materials Science from University of Minnesota in 1997; specialties: mechanical properties of thin films, micromechanics of fracture, adhesion, corrosion and environmentally assisted cracking.

David P. Field, Associate Professor; with WSU since 2000; Ph.D. in Mechanical Engineering from Yale University in 1991; specialties: Metal deformation and recrystallization, crystallographic texture, grain boundary structure, thin film and IC interconnect structure/properties relationships, and advanced experimental techniques.