Title: 9A. Nanotechnology Issues in the Future

Goal: Provide an understanding on the latest developments in nanotechnology applications. Understand the issues of taking lab-scale efforts to full-scale manufacturing.

Module Objectives: Educate the student so s/he is capable of evaluating new manufacturing concepts and correlating them to existing ones while evaluating possible environmental issues.

Prerequisite by Topic:

- Module 5A
- Properties of bulk materials

Required Text: None
Reading: Write-up of this module
References: [Refs. 14-17, 35]

Student Learning Outcomes:

- Understand the requirements for moving prototype to volume manufacturing
- Demonstrate the methods for controlling materials with unknown properties
- Be able to highlight differences in manufacturing for med-bio products from consumer products
- Have the ability to find novel material developments and the related testing results.

Topics Covered: (Green highlighted topics are priority#1, Yellow highlighted are if time permits)

- **Lecture I**
  - **Scaling from laboratory to volume production**
  - **Current trends in nanotechnology**
  - **Materials less than 15 nm**
  - **Two-dimensional nanomaterials**
  - **Novel electronics**

- **Lecture II**

  - **Changes in material dynamics**
  - **Material purity**
  - **Controls and metrology**
  - **Checking consistency of results**
  - **Addressing "used" nanomaterials**
  - **Anticipating environmental issues**
  - **Tracking latest developments**

Relationship to ABET Program Outcomes

[Note: Please, refer ABET program outcomes list (a) through (l) in attached standard template.]

(a) An ability to apply knowledge of mathematics, science, and engineering.
(e) An ability to identify, formulate, and solve engineering problems
(h) The broad education necessary to understand the impact of engineering solutions in a global societal context
(j) A knowledge of contemporary issues.