Title: 4B. Sustainable Nanotechnology Development

Goal: Students will have an appreciation of overview of sustainability. Nanotechnology development, its life cycle assessments

Module Objectives: This module will provide the students with an overview of sustainable Nanotechnology development. Topics that will be covered include: 1) Sustainability nanotechnology development a)Environmental sustainability b) Benefits the environment 2) Developing environmental regulation a) History of OSHA b) Nano materials standard by OSHA 3) Analysis of nanoparticles; a) manufacturing products b0 manufacturing process 4) Nano technology energy challenge: a) Sustainable energy; 4) Life cycle risk assessment a) Combined approach b) Life cycle process c) Life cycle thinking and risk assessments

Prerequisites by Topic:

- Understanding of Periodic Table
- Properties of bulk materials

Required Text:
Reading: Write-up of this module
References: [Refs. 21, 38, 42-43, 46, 51-55]

Student Learning Outcomes:

- Nanotechnology and environmental sustainability.
- Background of environmental regulations.
- Analysis of Nano particles in environment.
- Energy challenge by nanotechnology.
- Life cycle analysis and risk assessments

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

- **Lecture I**
  - Nanotechnology and environmental sustainability
  - Developing environmental regulations
  - History of OSHA
  - Nano materials standard by OSHA?
  - Nano materials manufacturing products
  - Analysis of Nano particles in environment

- **Lecture II**
  - Nanotechnology and energy challenge
  - Life cycle analysis and risk assessments

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.
(f) An understanding of professional and ethical responsibility
(j) Knowledge of contemporary issues.