

**Title: 2B. Applications of Nanotechnology**

**Goal:** Students will have an appreciation of applications of nanotechnology in variety of fields.

**Module Objectives:** This module will provide the students with an overview of the applications of nanotechnology that are already occurring in everyday life. Topics that will be covered include: 1) Environmental: a) nanomaterials for groundwater remediation; b) nanoparticle use in pollution control; 2) Health: a) Drug delivery; b) Gene delivery 3) Orthopedics applications; 4) Energy: a) solar and fuel cells; b) wind; c) internal combustion engines; 5) Information and Communication: a) memory storage; b) novel semiconductor devices; c) novel optoelectronic devices ; d) displays; 6) Heavy Industry: a) aerospace; b) nanoparticles in construction materials; c) lighter and energy efficient automobiles; 7) Consumer: a) cosmetics; b) textile; c) optics; d) agriculture; e) sports.

**Prerequisite by Topic:**

- Understanding of Periodic Table
- Properties of bulk materials

**Required Text:**

**Reading: Write-up of this module**

**References:** [Refs. 42-44]

**Student Learning Outcomes:**

- Nanomaterials can be both natural and man-made.
- Nanomaterials may have different properties from the bulk materials.
- Nanomaterials have improved everyday life.
- The applications of nanomaterials include all aspects of everyday life.

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

- **Lecture I**
  - Naturally Occurring Nanomaterials
  - Using Nanomaterials to Mitigate Arsenic from Groundwater
  - Using Nanomaterials to Clean up Chemical Spills
  - Nanomaterials in Medicine
    - Carriers of Chemicals
    - Enablers of Reactions (Au converting electromagnetic radiation into heat)
    - Analyses of Specific Chemicals (nanofluidics)
    - Implants
  - Automotive and Aerospace Applications
  - Material Properties
    - Enhanced Strength
    - Reduced weight
    - Improved Performance

- **Lecture II**
  - Nano-Electronics
    - Semiconductors
    - Evolving Designs for Enhanced Performance
  - Structural Applications
    - Materials
      - Stronger
      - Self-healing
    - Corrosion Resistance
    - Self-cleaning
  - Health and Beauty Products
  - Agriculture Applications

### 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.
- (j) A knowledge of contemporary issues.