Department of Materials Science and Engineering
University of Maryland, College Park, Maryland

1. **ENMA 442 – Nanomaterials**

2. **Credits and contact hours – 3 credits.** The University of Maryland follows the Maryland Higher Education Commission's policies on "contact hours;" specifically, one semester hour of credit will be awarded for a minimum of 15 hours, of 50 minutes each of actual class time, exclusive of registration, study days, and holidays.

   Schedule: meets two 75 minute periods per week

3. **Instructor's or course coordinator's name: Prof. John Cumings**

4. **Text book, title, author and year:** Nanostructures & Nanomaterials: Synthesis, Properties & Applications, by Guozhong Cao (Imperial College Press, London, 2004)

   a. Other supplemental materials: 1. Any introductory textbook on quantum mechanics, such as "Introduction to Quantum Mechanics", D. J. Griffiths, (Prentice-Hall, New York, 1994). 2. "Introduction to Solid State Physics," 7th ed. or 8th ed., C. Kittel, (Wiley, New York, 1996 or 2004). 3. "Transmission Electron Microscopy," David Williams and C.Barry Carter, (Plenum Press, New York and London, 2009)

5. **Specific course information**
   a. **Brief description of the content of the course (catalog description):** An exploration of materials whose structure places them at the boundary between small objects and large molecules. Having characteristic dimensions in the range of 1-100 nanometers, these materials are difficult to synthesize and characterize but are nevertheless at the forefront of science and technology in many fields. Also, the methods for creating, manipulating and measuring these materials with an emphasis on the current scientific literature will be covered. The novel properties and potential applications will also be addressed.
   b. **Pre-requisites or co-requisites:** Permission of the department.
   c. **Indicate whether a required, elective, or selected elective (as per Table 5-1) course in the program:** ENMA 442 is an elective course for Materials Science and Engineering majors.
6. **Specific goals for the course:**
   a. **Specific outcomes of instruction**: The course objective is to familiarize the student with the scientific concepts behind nanoscience and nanotechnology, and enable them to critically approach the scientific literature in the area and understand it.

b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed in this course.

ABET A: Ability to apply mathematics, science and engineering principles to design
ABET E: Ability to identify, formulate and solve engineering problems
ABET G: Ability to communicate effectively

7. Brief list of topics to be covered:

Carbon Nanotubes: Synthesis, structure, and electronic properties
Mesoscopics: Nanoscale electronics
Focus Areas (by class poll)
Nanomaterial PIs (by class poll)