

Engineering Mechanics & Astronautics

Department of Engineering Physics

College of Engineering

University of Wisconsin-Madison



EMA 601 - Micro- and Nanoscale Mechanics

Catalog Description

601 Micro- and Nanoscale Mechanics. I, II; 3 cr. Selected topics in such areas as structural mechanics, dynamics, experimental mechanics, vibrations, engineering materials, soil mechanics, engineering analysis, rheology, etc. P: Cons inst.

Course Prerequisite(s)

- See catalog description above.

Prerequisite knowledge and/or skills

Students should have a general understanding of mechanics and materials, and a deep curiosity in extending their knowledge beyond traditional bounds. This course is designed for students willing and able to work at least at the level of a first year graduate student. Literature reviews, critical peer discussion, and student presentations will be an integral part of the course.

Textbook(s) and/or other required material

No textbook will be used for this course. Course notes and technical papers will be utilized.

Course objectives

- To enhance students' appreciation of the current state and potential future impact of nanotechnology
- To demonstrate how specific physical behavior and engineering design requirements change with scale
- To show how engineering mechanics concepts can be used or appropriately adapted to describe essential behavior at the nanoscale, and to demonstrate the critical role that mechanics plays in the design and implementation of nanotechnology concepts
- To expose students to the cross-disciplinary intersections that occur between mechanics and materials science, chemistry, physics, and biology when working at the nano-scale.

Topics covered

- Introduction to nanotechnology, overview of new opportunities, connections to mechanics
- Brief overview of synthesis techniques

- Overview of relevant mechanics concepts including mechanics of materials, fracture mechanics, contact mechanics, elasticity
- Atomic structure of materials, phase transformations, defects, dislocations
- Mechanical testing and material property determination at small scales including size-scale strength effects
- Surface characterization including scanning probe techniques, surface forces, and diffusion
- Using mechanics in micromachines (MEMS): application, design, performance, and testing
- Theory, modeling, and computational techniques for mechanics modeling of nano-systems including MD of fracture mechanics, mixed atomistic /continuum modeling of sliding friction
- Mechanics aspects in nano-biomaterials, molecular machines

Person(s) who prepared this description

- Kenneth Lux

Copyright 2003 The Board of Regents of the University of Wisconsin System
Date last modified: Monday, 20-Jan-2003 13:03:55 CST
Content By: ema@engr.wisc.edu
Markup By: webmaster@engr.wisc.edu

Thank you for visiting!