ME 273 Jan 3:0

Solid and Fluid Phenomena at small scales

Instructor

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Department: Department of Mechancial Engineering

Course Time:

Lecture venue:

Detailed Course Page: http://www.mecheng.iisc.ernet.in/%7Ebobji/smallscales/me_273.html

Announcements

Brief description of the course

This course looks at the behaviour of matter at scales smaller than engineering scales but larger than atomic scales. This advanced elective is meant to explore the submicron/micron scale behaviour of solids and fluids and their application in mechanical engineering.

Prerequisites

none

Syllabus

Introduction : Size effect, Volume/surface ratio, Material failure

Intermolecular forces: Atomic structure, Covalent and Coulomb interactions, Dipoles, Dipole interactions, Van der Waals forces, Interatomic potentials

Surfaces: Adhesion, Surface energy, Surface Tension, Surface Roughness, Contact angle

Defects : Vacancies, Dislocations, Grain Boundaries, Size dependent strength

Micromechanics

NanoIndentation, AFM, Surface force apparatus

MicroFluidics: Solvation and Double Layer Forces, Slip Boundary Condition

Applications

Course outcomes

Broader perspective of mechanical behaviour of materials especially at small scales.

Grading policy

50% for 2 assignments and 2 tests

50% for final

Assignments

Resources