

Winter Term, 2017
ME574 Nano/Micro Structure Evolution
Instructor: Wei Lu (weilu@umich.edu)

Time: Monday, Wednesday 1:00PM - 2:30PM in 1018 DOW

Course Description: Nanotechnology is an emerging technology that will lead to major advances in electronics, materials, biomedicine and national defense. It has the potential for revolutionizing the ways in which materials and products are created and the range and nature of functionalities that can be accessed. Materials exhibit fundamentally new behavior when their building blocks fall below the critical length scale associated with any given property. Thus, essentially any material property can be dramatically changed and engineered through the assembly of nanoscale building blocks. This course focuses on an important area - how the nano structures assemble and evolve.

Why are we interested in the nanostructure evolution? It is important to the understanding of various phenomena in nanoscale. It provides guidance in fabricating the desired nanostructures. Modern electronic and photonic devices are solid structures of small feature sizes. Processes like diffusion relocate atoms, and the structures evolve over time. Such a structural change is a nuisance when, for example, a film breaks into droplets, or an unexpected phase appears. Yet the changes themselves can be exploited to fabricate devices. In either case, as feature sizes decrease, insight into forces and energetics operating in small dimensions becomes indispensable.

This course will focus on scientific understanding. The ideas and methods to model the nano/micro structure evolution will be introduced by examples. We hope that the students will know and understand important processes and phenomena that appear in micro/nano structures, and have the potential to solve new problems. The students will have the opportunity to propose a project based on his/her own research area. In the past, the course has helped to solve real research problems related to the student's thesis work. Some of the topics that will be covered include:

- Configurational Forces
- Formulation of Migration
- Simulation of Structural Evolution
- Surface Roughening
- Motion of Thin Film
- Composition Modulation
- Electromigration
- Self-assembly

Grading will be based on 4 homework assignments and one group project. Pre-req: Graduate or Senior undergraduate students.

Grading System: Homework (40%) Project (60%)

For previous projects, please check website:
<http://www-personal.umich.edu/~weilu/me574/>