Multiscale Methods (update: 20240804)

1. Introduction (3 sessions)
2. A review of continuum mechanics (2-4 sessions)
    a) Kinematics of deformation
    b) Conservation laws
    c) Constitutive equations
    d) Plasticity and damage mechanics
3. Homogenization methods (14-16 sessions)
    a) Introduction
    b) RVE/unit cell
    c) Asymptotic solution
    d) Computational Homogenization (Averaging)
    e) Variational Multiscale Method (VMM, VME, MEPU)
    f) Micro-based Homogenization
4. Micromechanics and crystal plasticity (4 sessions)
5. Statistical mechanics (8 sessions)
    a) Thermodynamics
    b) Lagrangian and Hamiltonian
    c) Statistical Mechanics
    d) Ensembles
6. Molecular dynamics (4 sessions)
    a) MD and MS
    b) Monte Carlo
7. Sequential multiscale techniques (3 sessions)
    1. Macro to micro models
    2. Micro to macro models
8. Concurrent multiscale methods (9 sessions)
    a) Overview of concurrent methods

b) Macroscopic, Atomistic, Ab Initio Dynamics (MAAD)

c) Quasicontinuum method (QC)

d) Bridging domain method (BDM)

e) Coupled atomistic and discrete dislocation (CADD)

f) Bridging scale method (BSM)

g) Disordered concurrent multiscale method (DCMM)

h) Variable node multiscale method (VNMM)

i) Enriched multiscale method (EMM)

9. Other multiscale methods (2 sessions)
10. Multiscale methods in biomechanical applications (3 sessions)
11. Machine learning in multiscale simulations (2 sessions)
12. Closure (1 session)