

Short Course on Meshfree Particle Methods

8:30-8:40	Opening Remarks
8:40-9:30	Overview of Meshfree Particle Methods W. K. Liu
9:30-9:40	Break
9:40-10:30	Accelerated and Adaptive Meshfree Methods J. S. Chen
10:30-10:40	Break
10:40-11:30	Application of Meshfree Method H. Noguchi

All meshfree particle methods share a common feature: the discretization of a Partial Differential Equation does not rely on a structured meshing topology. This unique property provides meshfree methods with considerable advantages over conventional finite element methods in solving problems involving moving discontinuities, multiple-scale phenomena, and large material distortion and structural deformation. The most significant advantage is the flexibility in customizing approximation functions for desired smoothness, accuracy, or special characteristics of particular engineering and scientific problems. Adaptivity formulation and multiple scale solution strategies can also be implemented with relative ease.

The objective of this short course is to provide introduction on the fundamental theory and recent advances in meshfree methods. Several classes of meshfree methods will be reviewed. This includes particle methods, Galerkin meshfree methods, and molecular dynamics. Issues related to boundary conditions, domain integration, adaptivity, and coupling with finite elements will be discussed. Application to large deformation analysis of elastomers, metal forming processes, geo-mechanics and earth moving processes, plates/shells and spatial structures, and moving discontinuity and ALE formulation will be demonstrated. Future directions of meshfree methods will be outlined.