

CEE 498CM/CEE490: Computer Methods

2020 Spring, Tuesdays/Thursdays

Instructor: Prof. Jinhui Yan

This course covers computer methods and their programming for solving common types of differential equations in engineering. Students will be exposed to state-of-the-art open-source numerical methods libraries. This course will enable students to develop high-performance and high-purpose codes in these open-source frameworks for their research problems in an efficient way.

- 1) Review of Linear Algebra.
- 2) Solutions of Linear Systems
 - 2.1) LDU/Gauss Elimination/ QR Factorization
 - 2.2) Eigenvalues / Eigenvectors / Condition Number
 - 2.3) Iterative Methods
 - 2.3.1) Jacobi, Gauss-Seidel, SOR
 - 2.3.2) Residual Methods
 - 2.3.2.1) Steepest Descent
 - 2.3.2.2) Conjugate Gradient
 - 2.3.2.3) GMRES
 - 2.4) Singular Value Decomposition
 - 3) Solutions of Non-linear Algebraic Systems
 - 3.1) Newton Methods
 - 3.2) Eigenvalue Problems
 - 4) Discrete Calculus
 - 4.1) Numerical Differentiation/Integration
 - 4.2) Numerical Solution of ODEs.
 - 4.3) Numerical Solution of PDEs.
 - 5) Introduction to Open-source Packages
 - 5.1) PETs
 - 5.2) FEniCS

