

Course Name:

Nonlinear Modeling of Structures and Materials

Course Number: 20-898	Credit: 3
Program: Graduate	Course Type: Technical Selective
Prerequisite: -	Corequisite: -

Course Description (Objectives):

This course introduces fundamental concepts of numerical modeling and nonlinear analysis of structures and materials, including nonlinear element behavior, numerical solution methods, dynamic analysis, geometric nonlinearity, and material models for steel, concrete, and soil.

Course Content (outline):

- Chapter 1: An overview on matrix structural analysis
- Chapter 2: Nonlinear behavior of truss element
- Chapter 3: Numerical procedures
- Chapter 4: Nonlinear behavior of beam element (fiber- hinge)
- Chapter 5: Dynamic nonlinear analysis of beam elements
- Chapter 6: Geometric nonlinearity in truss and beam elements
- Chapter 7: An overview on finite element method
- Chapter 8: An overview on plasticity in solid elements with finite element implementation
- Chapter 9: Constitutive material models

References:

- Bathe, K.J. (1996), Finite Element Procedures, Prentice Hall, Englewood Cliffs, NJ.
- McGuire, W. (1999), Matric structural analysis, Wiley
- Crisfield M. A. (1996), Non-linear finite element analysis of solids and structures, Wiley
- Chen W. F. (1985), Soil Plasticity: Theory and Implementation, Elsevier Science
- Chen W. F. (1981), Plasticity for structural engineers, Springer
- Owen D. R. and Hinton E. (1981), Finite elements in plasticity, McGraw hill
- Simo J.C. and Hughes TJ.R. (1997), Computational Inelasticity, Springer