Course Name:
Nonlinear Modeling of Structures

Course Number:
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Credit:
3

Course Content (outline):

- An overview on matrix structural analysis (direct stiffness method, PVD, PVF)
- Nonlinear behavior of truss element
- Numerical procedures
  - Implicit procedures
  - Explicit procedures
  - Force-controlled loading
  - Displacement-controlled loading
  - Arc-length
- Nonlinear behavior of beam element (fiber- hinge)
  - Steel brace
  - Steel beam (monotonic - cyclic)
  - Concrete beam (monotonic - cyclic)
- Dynamic nonlinear analysis of beam elements
- Geometric nonlinearity in truss and beam elements
  - Buckling
  - Large displacements (corotational – P-D)
- An overview of finite element method (accompanied with coding)
  - Axisymmetric, plane stress and plane strain problems
- An overview on plasticity in solid elements with finite element implementation
- Constitutive material models
  - Steel (Von Mises)
  - Saturated and unsaturated soil (Cam-Clay)
  - Concrete
  - Masonry
References:

- Crisfield M. A. (1996), Nonlinear 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