Università degli Studi di Napoli Federico II

Scuola Politecnica e delle Scienze di Base

Nell'ambito del corso di **Dottorato** in
Ingegneria Strutturale, Geotecnica e Rischio Sismico

Dott. Ing. Francesco Marmo

Dipartimento di Strutture per l'Ingegneria e l'Architettura
Università di Napoli Federico II

Computational methods in nonlinear analysis of structures

Taking the cue from the numerical issues pertaining to the behaviour of frames, the course presents some of the computational methods for the nonlinear analysis of structures. More in detail, addressed topics are:

- Numerical strategies for the nonlinear analysis of frames: Static analysis: Newton method, with load, displacement and Arc-length controls. Dynamic analysis: Central difference method, Newmark method.
- Beam elements based on stiffness formulation: Principle of virtual displacements. Kinematic assumptions. Evaluation of strains and stresses. Shape functions. Stiffness matrix and load vector.
- Beam elements based on flexibility formulation: Equilibrium of beams. Principle of virtual forces. Elimination of rigid-body modes. Interpolation of nodal forces. Flexibility matrix and nodal displacement increments. Element state determination. Elimination of iterations at the element level. Recovery of the displacement field.
- Numerical issues: Quadrature rules for the evaluation of element integrals. Localization and size effects.
- Evaluation of section response: Uniaxial stress strain laws for steel and concrete. Evaluation of sectional forces and stiffness matrix. Numerical quadrature. Formulas for polygonal sections.
- Sectional analysis: Ultimate Limit State analysis of reinforced concrete sections subject to axial force and biaxial bending. Strength domains of RC sections.

June 8 – 11, 2020, 10 am to 1 pm & 3 pm to 6 pm

The course is offered online on MS Teams

Please contact Dott. F. Marmo (f.marmo@unina.it) to be added to the Class

Il Coordinatore del Dottorato
Prof. Ing. Iunio Iervolino

Il Direttore del Dipartimento
Prof. Ing. Andrea Prota