COMPUTATIONAL MECHANICS OF TWO-DIMENSIONAL AND THREE-DIMENSIONAL SOLIDS AND STRUCTURES (3CFU)

Prof. Ing. Fabio De Angelis

Structural analysis of two-dimensional solids. Theory of elastic equilibrium of plates. Numerical methods for the solution of plates. The finite difference methods. Theory of elastic equilibrium of in-plane loaded slabs. Numerical methods for the solution of in-plane loaded slabs. Energy methods. The Rayleigh-Ritz method. The Finite Element method for the solution of two-dimensional and three-dimensional continua. The shape functions. Assembly of stiffness matrices. Assembly of equivalent nodal actions. Completeness, compatibility and convergence conditions. Local and global reference systems. Interpolation methods. Types of finite elements. Isoparametric elements. Numerical integration methods. Applications of the Finite Element method for the strain and stress analysis in two-dimensional and three-dimensional continua. Nonlinear analysis of solids and structures with the Finite Element method. Incremental formulations. Computational methods for inelastic problems. Plasticity and viscoplasticity for J2 materials. Linear and nonlinear isotropic and kinematic hardening rules. Consistent tangent operator. Numerical applications for continua in which nonlinear hardening modeling is required. Computational simulation of the mechanical behavior of solids subject to cyclic loadings and cyclic plasticity. Numerical examples and applications to the analysis of two-dimensional and three-dimensional solids and structures.