Department: Mining Engineering   **Division:** Rock Mechanics

 Level and Major: MSc, Rock Mechanics

Course Title: Continuum Mechanics in Rock   **Number of Credits:** 3

Lecturer: Dr. Hossein Salarirad

Course Goals and Objectives

Introducing students to the fundamentals of solid mechanics and solving practical problems in rock mechanics.

Course Topics

- Stress definition and relationships in isotropic and non-isotropic three-dimensional elastic media, convention, and definitions
- State of stress, Stress tensor and deviatoric stress tensor, projection of stress components on a surface
- Stress balance equations, principal stresses, Invariant stress tensor, and Mohr's circle
- Maximum shear stresses and octahedral stresses
- Deformation in Lagrangian and Eulerian coordinates
- Strain and displacement definition, conventions, Linear and nonlinear relationships and tensors, Strain-Displacement compatibility equations
- Stress-strain relationships in non-isotropic and isotropic elastic environments, elastic strain energy
- Linear elasticity and generalized hook law
- Linear elastic relationships in Anisotropic and Isotropic materials
- Problems solution of Rock Mechanics based on the linear elasticity Solving 1-D and 2-D problems, plane strain, plate stress
- Elasticity equations based on displacement components, Navier equations, and stress, Beltrami-Michel equations
- Stress functions, Airy stress functions, Problem-solving in geomechanics using Airy stress functions
- Perfect elastic-plastic behavior of solids, typical stress-strain curve of a homogeneous isotropic material under tension in isotherm conditions
- Tresca, Von Mises, Mohr-Coulomb, and Draker-Prager Criteria, Yield surface function and Floe rule
- The solution of some applied problems in rock mechanics based on the nonlinear plastic criteria